ELECTRICAL REVIEW

[ILLUSTRATED.]

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The Boston Exchange.

SHOWING THE WESTERN ELECTRIC COMPANY'S MULTIPLE SYSTEM, AND DESCRIBING ITS EXCELLENT WORK.

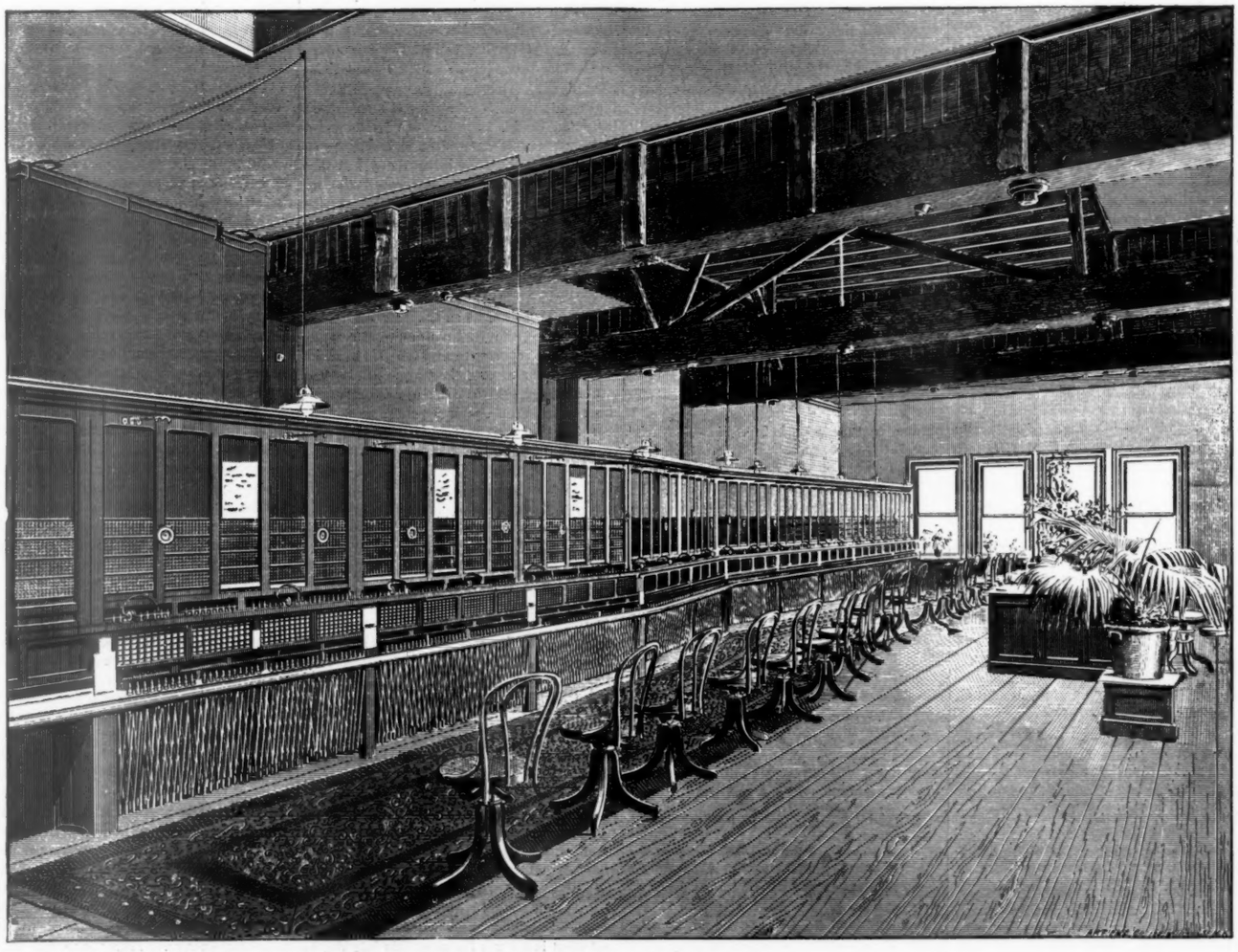
We illustrate in this issue of the Review the interior of the Boston telephone exchange, the handsomest and best arranged large exchange it has been our privilege to see. All of the interior of the exchange is shown, except the toll room, a cosy room on the right. The flowers which are a permanent part of the exchange, are gifts from Mr. T. N. Vail and Mr. J. T. Wheeler. In this connection we publish the paper on "Multiplex System Switchboards," read to the Telephone Convention by Mr. J. J. Carty, manager of the Boston exchange, and a very capable official. He said:

"The multiplex system is too well known to require description here, and the arguments for and against it have been heard so frequently that I need not repeat them. In order to show what can be accomplished by the use of the system I have thought best to give some results already obtained from its working at Boston. Boston is chosen not only because it is the largest plant in operation and embodies all of the latest improvements, but because there some very difficult conditions were met, and a description of how these conditions were fulfilled will give a very good idea of the value of multiple boards.

"At one time the Boston exchange consisted of one large central office with a few small branch offices within the city limits. This state of affairs has changed during the past few years, owing to the rapid growth of the suburban business so that to-day Boston has twenty-one branch offices, which include with the central office, some 4,500 subscribers. The extra-territional business also required special attention. Boston is within easy speaking distance of more than 900,000 people. This means great possibilities for toll business, but its growth heretofore has been seriously retarded on account of the impossibility of giving it proper attention with the old apparatus. It was necessary that the multiplex system should be sufficiently comprehensive to admit of handling a large extra-territorial business in the near future. With the old boards, but few more subscribers could be added on account of the lack of connecting strips. The multiple boards were required to have over 4,000 lines, or more than double that of the other boards. Of course the introduction of the new system was expected to result in a great improvement in the general service. Another important requirement was that the boards should be practically free from 'cross-talk,' and that the cables furnished should be moisture proof, because the air of Boston is unusually damp. Still another requirement was that the work with the new boards be performed with fewer operators.

"After the boards were put in operation there was a gradual improvement in the service for about a month, which was no doubt due to the increasing efficiency of the operators. At this time improvement ceased, without effecting the desired saving of operators. The principal difficulty was with the branch office service, and arose from the fact that when a subscriber wanted a branch office party he gave the number to the central office operator who had to report the call to the branch office. It frequently happened that while waiting for a branch office to answer, a number of calls came in, all of which were neglected until the central office got her answer and repeated the call. To avoid these annoying delays, subscribers were asked when calling for a branch office number to call for the office at which the number wanted is located, and, having obtained that, give the number to the operator there.

"When the subscriber became accustomed to the new way of calling, a great improvement was noticed, and it soon became abou



New Multiple Board, Built by Western Electric Co. for N. E. Telephone Co., Boston, Mass.

as easy to take care of a branch office call as one which is strictly local. This branch office has been referred to somewhat at length because it is the weak point in all systems, and should be carefully looked at by those introducing the multiple boards.

"The following plan was adopted to provide for the extra-territorial business: Ten 10-wire toll boards were set up, to which the extra-territorial lines were led direct without going through the regular switch-boards. Each of these toll-boards was provided with cords and plugs connecting with a special switch-board presided over by a listening operator. Now, if an extra-territorial party wants a number in the local exchange, it is simply necessary for the toll operator receiving the call to telephone the listening operator and have the line wanted plugged to the toll-board. In this way one switch-board can be made to serve ten or more toll-tables. In the case of a subscriber in the local exchange calling for an extra-territorial point, it is simply necessary for the local operator to plug the subscriber's line to a spring jack, which connects with the proper toll operator. The act of inserting the plug throws a drop on the toll table, which is to be answered at once. The subscriber waits to give his call to the second operator, after which the connection is rung off by the toll operator from the local operator's table, and that ends the matter as far as she is concerned. The actual connection with the extra-territorial line is made direct through the toll-room switch-board, only one pair of cords and one drop being in circuit, and it is managed so that the drop can be shunted if desired. The extra-territorial plant proved a most satisfactory feature of the service from the beginning, and, owing to the improved work done, the toll receipts have considerably increased.

"There is no reason why this system cannot be extended to an almost unlimited extent, and wherever a large number of toll operators is required it is especially recommended. Owing to lack of space in the main exchange, a separate room had to be provided for the toll business. This is to be regretted, as experience clearly shows that the business for a long time to come can be better and more economically handled in one room than in two. Attention is called to this as a separate toll room has been recommended by some who claimed for it special advantages, none of which it is found to possess. As to the provisions for growth, it has already been shown that they are ample in the case of the toll lines and in regard to the local wires, when we consider that the ultimate capacity of boards is practicably 4,000 lines. it seems enough to satisfy the demands of growth for some time to come. In regard to the effect of the introduction of the multiple system on the service in general it must be said that it has resulted in a gratifying change for the better, and, although there is still room for improvement, the service is very much superior to anything ever known in Boston.

"In connecting the boards a very much larger amount of cable was used than in any previous installation, and grave fears were entertained of trouble from induction, retardation and leakage. Talking through the boards, however, proved to be better than before, and no trouble is experienced from any of the above causes, except when a loud-speaking transmitter is used, and then conversation can be heard on adjoining lines. This is not to be wondered at as the same and even worse effects have been observed in the so-called 'straight' boards. This practical immunity from 'cross talk' proves that the cable used is moisture proof, and that the anti-induction appliances adopted are effective. The cable referred to is a form of Patterson cable, known as the lead-tape variety, so called from its envelope of lead tape or foil, which keeps out moisture, and serves as an induction shield, being connected to a journal. It is important to note that, although each line passes through eleven switch-boards, the talking has not suffered, but has actually been improved. The fact of this improved talking has been noticed and commented upon by subscribers. This result is obtained because the line is not obliged to pass through a drop on each section of switch-boards, but is carried through a cable of high insulation, and whenever it appears at the face of a board is led through a spring jack which measures, contact and all, a very small fraction of an ohm. It is well known that lines which pass through a number of ordinary switch-boards never work well. This is for three reasons: First, there are always two or more drops in circuit, and it can be shown that the presence of even one electro-magnet in a line exercises a retarding effect on the current. Second, there are apt to be poor contacts caused by the plugs used, in working the connection. Third, there is always more or less loss of current by leakage. The first two causes, as might be inferred from what has been said, are not present in the multiple boards, and no trouble is experienced from the third because the total surface of the eleven spring jacks, which is exposed to leakage, is not equal to that offered by one line and connecting strip in an ordinary board. A comparison of the operating force of last winter under the old system with that of to-day, working the multiple system, shows a decrease of 25 per cent. in favor of the latter. The plant in the old office consisted of 34 fifty-wire and five twenty-five-wire Gilliland boards. There were about 1,650 subscribers, 90 branch, and 30 extra-territorial lines. The extra-territorial lines were handled by five operators on the 25-wire boards, on each of which there were a dozen or so subscribers. This called for a force of 39 operators on tables at any one time, 7 operators for relief, and 7 night operators, making a total force of 53. With the multiple system, only 20 operators are required to fill the boards in the main exchange, with 5 relief and 4 night operators. In the toll room 11 operators are required, including the chief, 1 relief and 2 night operators. This makes a total of 40 operators handling 1,700 subscribers, 152 trunk lines, and shows a saving of 13 operators. The present equipment will accommodate 200 more subscribers, and if it is not found necessary to add more operators when the boards are full (and the indications are that it will not), a still further saving of two operators will be made.

"From the fact that the operators at the new boards were obliged to care for a larger number of lines than before, it was feared that they would not be able to work the required number of hours, and would have to be frequently relieved. This has not been the case, however, as owing to the comforts with which they have been surrounded, and the remarkable ease with which connections can be made by the new system, the operators have really a much easier time than before. How much work an operator can do at a multiple board in a day is an important question for those about to adopt the new board. At Boston operators frequently attend to 700 calls a day, and think they could make 900 without any hardship; at Pittsburgh 750 calls a day is considered very good work, and about 700 calls a day are being made at Louisville, but the managers there think this number could be increased several hundred without overworking the operator. The New Orleans people consider 1,500 calls a fair day's work for an operator at their boards, while at Indianapolis the number is set at about 1,000. Twenty-two hundred and twenty-six calls were made by an operator at the Nashville boards the other day, and she was not the most expert operator, neither was it a busy day.

"Two of the objections most frequently urged against the multiple system is the breakage of cords and poor contacts in spring jacks. Out of 1,100 cords in use since May 1st, but three have been broken and they have been repaired and are now in use. The cords used are a combination of tinsel and spiral wire, suggested by Mr. Keller. But two faulty contacts have occurred in twenty-seven thousand spring jacks, and those resulted from accidents.

"It is a fact not generally known that the present form of multiple board can be used for metallic circuits without any radical changes."

Underground Wires.

THE PAPER DELIVERED BY W. R. PATTERSON, INVENTOR OF THE PATTERSON CABLE, BEFORE THE TELEPHONE CONVENTION.

We publish in the REVIEW this week, the complete address of W. R. Patterson, of the Western Electric Company, on "The Underground Problem." The paper is valuable, and some interesting points are made in a way at once entertaining and impressive:

There are two classes who do not admit the existence of "the underground problem," namely, the enthusiastic inventors and promoters of "systems," and the average State and city legislator. The two form a mutual admiration society of gentlemen of vast scientific attainments and disinterested philanthropists. One of the former will admit that it used to be a problem over which electricians had labored in vain; the subject was accidentally brought to his attention by a newspaper report of the delay to the firemen caused by a lot of wires. It immediately occurred to him that these wires might be put under ground. He lays no claim to any electrical knowledge, but is only a man of marked practical common-sense, unhampered by any scientific hair-splitting. Governed only by the practical common-sense requirements of the case, he devoted several hours to thinking on the subject, and the problem was solved. Not satisfied with its general solution, he subsequently went through a long course of mental experiment, thoroughly reduced it to paper, and had it patented. It now only awaits your adoption. The promoter of the Universal Electric, Signal, Telegraph, Telephone, Electric Light and Power Transmission, Underground Insulated Cable, and Conduit Construction Company knows the system can only be an unqualified success. Isn't it patented? If that isn't enough, didn't the attorney tell the inventor that an examiner in the office overheard the Commissioner say to the Secretary of the Interior that there wasn't anything in the earth, or the heavens above, or the waters under the earth, that in any way resembled this wonderful invention?

Some rainy day, when the base-ball game is postponed, the leading newspaper sends its scientific reporter to find out all about the subject. The reporter is a young man, just out of college, where he has learned all about the recession of Greek accents; he laughs scornfully at the man who asks him how they make those little telephone wires hollow; and the next day furtively picks up a piece to examine, finds it solid, and thinks he may have been mistaken after all and got a piece of telegraph wire! This knowledge, backed by a vivid imagination, and all the information obtainable from the inventor, furnishes the basis of a long local article, and of an editorial, in which is duly set forth the meanness, heartlessness, and want of regard for the rights, property and lives of our citizens on the part of these grinding monopolies. The philanthropic legislator is impressed by all these things. He "don't" take no stock in them scientific chaps; they are all in the pay of some big monopoly, and everyday hoss sense is good enough for him." He knows of no obstacle, mental, physical or moral, that money will not overcome, and here is a chance to get at these "grinding monopolies," help the struggling inventor, make business good, and get the vote of that man who is kicking about a telegraph pole in front of his house. So an ordinance is passed requiring all the wires to be placed under ground within thirty days, and what is the use for us at this late day to talk about an underground problem?

You, gentlemen, have all read the information furnished by such a reporter, have suffered under such a legislator, and been taught your business by such an inventor. It has been demonstrated to you beyond question that your wires will work better, and for a longer distance, and that there can never, under any possibility, be any outlay for repairs or reconstruction in this underground system. If you have not already, it is probable that you soon will meet with a sufficiently enthusiastic promoter who will demonstrate mathematically that the junk value of your old wire and insulators, and the kindling-wood value of your poles and fixtures will pay for an entire and absolutely perfect underground system. Yet, in spite of all these demonstrations, and in spite of the assumed power of a city council to regulate not only the laws of trade, but the laws of nature, it is a fact that men who are practically interested in the matter still see difficulties in the way. These difficulties may be divided into three general classes, scientific, mechanical and financial. One man tells us there are no scientific difficulties in the way of underground telephony, and another tells us they are insuperable, and both are right. If it is only a question of talking across the street, there are none; if it is a question of talking across the ocean or a continent, they are insuperable, with our present knowledge. It would be very rash to claim that they must always be so, but it will take something besides an act of the legislature, or an ordinance of the city council to overcome them. The scientific obstacles in the way of unlimited and universal underground telegraphy and telephony are retardation, escape and induction. These difficulties are common to underground wires for all uses, but are especially troublesome in telephone work. It is the subject which has received least attention from inventors of systems, and it seems entirely beyond the comprehension of most people that an underground wire, say from the Harlem river to Jersey City or South Brooklyn, may, in some respects, be an exact counterpart of an aerial line from New York to Buffalo or Pittsburgh.

The causes of retardation are well understood, and its laws well defined, both by mathematical reasoning and by actual experiments upon long submarine cables. Every text-book of electricity gives formulas for the speed of working cables, and in connection therewith the distance which a cable of any specifications can be worked at a given speed, which is the telephonic way of stating the case. If a telegraph cable will not work at the rate of forty words per minute, i may be perfectly feasible to work it at a speed of twenty, and it is only a question of providing a duplicate cable, if the business requires forty to be sent. But the laws of acoustics fix the number of vibrations per second for any definite sound, so if a cable cannot carry the requisite number, that is an end of the matter. The distance which can be marked is shown to be a function of the resistance of the conductor and its electro-static capacity. In the present state of metallurgical science it is not to be expected that a better conductor than copper can be found. While chemists and others, principally others, can turn out new insulating compounds almost without number, they can all be grouped in a few generic classes, the properties of which are well understood. It is not to be expected that a material of lower inductive capacity than air can be discovered, or an insulator suitable for underground use which even approximates the low capacity of air. We cannot make up the deficiency by increasing the thickness of the insulator indefinitely, because that has comparatively small effect. Besides these theoretical objections there are practical difficulties in handling a large number of wires which necessarily limit the size of each, and, finally, there is a limit to the last which precludes the use of metal and insulator in unlimited quantities per foot. The other factor, the resistance of a telephone circuit, has been generally, until of late, considered to be of little importance. Every one has talked through a wet string, or through a man's body, or in some such way shown that the current sent by the transmitter will overcome resistances which would be a practical break in a telegraphic battery circuit. But we have seen that the resistance of the circuit is one of the elements which determine the speed of working, or the distance which can be worked at a given speed; so it becomes a matter of the utmost importance that not only the resistance of the cable conductor shall be low, but that all other parts of the circuit, especially ground connections and splices, shall be of low resistance. With all these well-defined and unchallenged limita-

tions, there can be but one result—the length of wire which can be successfully worked must be limited.

If we had to provide for but one city, the limitation might not be troublesome; bu there is a demand for communication between distant places. While the underground wires may work perfectly in one city, when a long aerial line is attached the conditions are entirely changed, and it will not improve matters any if there is an extensive underground circuit at the distant end. This question of the possibly required aggregate underground mileage in a thickly-settled country is the hardest part of the problem. This year it is only for cities of over 500,000 inhabitants, but how long will it be before cities of 100,000 inhabitants will follow suit, and villages of 1,000, seeing in underground wires a feature of metropolitanism that will cost them nothing, will, before many years, be asking for commissions and enactments.

The second difficulty we have referred to is the escape of the current. This escape is to be considered in three aspects—first, as so much direct loss; second, in its effects upon other conductors; and third, in its effects upon the medium through which it passes. In both the first two effects aerial lines share equally with underground, and there is nothing in either to limit or destroy the efficiency of underground wires. But in the third aspect—the effect of the escaping current upon the medium through which it passes—underground wires are peculiarly liable to injury and destruction. In case of an aerial line, whatever current escapes and does not get upon other wires, goes harmlessly to ground. In underground wires, wherever it goes, it first passes through the insulator. Electricity is a great promoter of chemical changes, and though the current passing through the insulator may be very small, almost inappreciable with ordinary instruments, yet, when it is continued for an indefinite length of time, the aggregate effect may be serious. For this reason a high initial insulation is the best guarantee of durability, provided only the material exposed to the action of the elements has stood the test of time. The specific insulating quality of any material used for an insulator is so high that, unless this result is obtained, it is conclusive evidence of some fault in manufacture, which may become serious. But the difficulties to be overcome in securing high insulation are of more practical interest to the manufacturer. In the matter of induction we have nothing essentially different from the troubles experienced on aerial lines. While the proximity of the conductors in cables would seem to offer the best conditions for the establishment of induced currents, the proximity of the earth, to a great extent, prevents their becoming troublesome. Metallic shields, wholly or partly surrounding the conductors, individually, or in groups, are a well-known device for preventing induction, and the use of a symmetrically-placed return-wire is an absolute cure for the trouble. But the remedy may be worse than the disease, if too much is taken to cure a slight case, since the return wires increase the resistance of the circuit, and other things being equal, the nearer the ground the higher the inductive capacity, and induction is only exchanged for retardation. In case of very long cable lines, induction is a factor not to be neglected. We know only two ways of removing it, namely, by increasing the length of the wire, and by increasing the inductive capacity. This is the problem, then, to be solved. Construct an underground system, the ultimate extent of which is an unknown quantity, so that neither induction nor retardation will render it useless.

After the mechanical work connected with the manufacture of the wire and its insulation is properly performed, there still remain mechanical difficulties to be overcome in laying the wires so as to secure the utmost possible durability, or even to insure any service at all. None of these mechanical obstacles are insuperable, or offer as much difficulty as the electrical requirements which we have discussed; yet they are not to be neglected, as any want of forethought or care in handling and protecting the wires may destroy the best electrical work. Most of the mechanical difficulties experienced are of such varying character that only a careful study of the conditions existing in each place can overcome them. In general, the system which requires the least possible work to be performed in the street will escape much of the danger of injury. The number of impossible things that happen, and the grand aggregate of all the little things that are done to the detriment of the work by an inquisitive crowd, the weather, and the total depravity of the inanimate matter, would seem incredible to any one who had not experienced them. What is the best method of protecting underground wires from external injury is as easy to decide as the best way of protecting human life from loss by accident and violence. The ideal protection for underground wires would be a dry, light, roomy and well-ventilated subway. Such a one can be constructed with the utmost facility on paper. It would be found in a city built to order under one comprehensive plan, and before it is lined in, completely equipped for a hundred thousand or a million inhabitants, as the case might be, with no subsequent additions allowed. But we have to take cities as we find them, which, like Topsey, "have growed." With the existing systems are more generally lack of systems of sewers, water steam, and gas-pipes, street railways, and the general plan of streets and alleys. Such a subway is impractical. We are reduced to two general methods of protection. One is, to lay the wires or cables, and fill in around them with a mass of protecting material, as asphalt or cement; the other is to draw the cables into a previously constructed conduit. Neither method is free from disadvantages, when compared with the ideal subway, but the conduit plan seems to have less than the other, and to offer some advantages which are a fair return for the additional expense. In the choice of a method of protection all the local conditions are to be considered, and a plan which is successful in one place may be a failure in another.

Fig. 3.

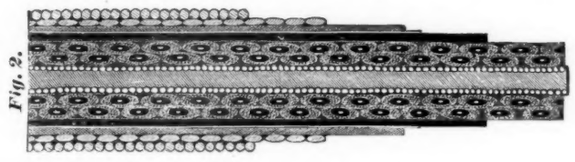


Fig. 2.

Fig. 1.

THE NEW OKONITE CABLE.

The third class of objections we see are financial. It needs no argument to show that it will cost a great deal more to put all the wires of an exchange under ground than to carry them on poles and house-tops. Saying nothing about its theoretical advantages, air is by far the cheapest insulator known. The insuperable part of the financial difficulty is the proposed throwing away of a full equipment of lines which are in working condition, and replacing them by an entirely new and more expensive system. To even overcome the difficulty due to the difference in cost the exchange must be made gradually—no faster than the existing lines need renewal.

After all this enunciation of the difficulties in the way of underground service, it may seem that we have left no useful field for it. But there is an extensive field open to such service, and we wish only to look at the matter fairly and impartially, recognizing the existence of serious obstacles which can not be dismissed with a word. We are also convinced that within these limitations there are no reasonable doubts of the perfect success of underground service, as far as any electric troubles are concerned; that, while no rigid system may suit all places, there are no mechanical difficulties that cannot be solved by attention to the local conditions; and, finally, there are no financial objections which are more far-reaching than the others, or which would be serious if the changes were made gradually. In the proper municipal supervision of electric wires there seems to be an exact parallel with supervision over buildings. When a city reaches any considerable size, the general welfare demands the establishment of fire limits, within which the use of inflammable building material shall be restricted. But it has never gone to the extent of compelling owners of wooden buildings within these limits to tear down their structures and replace them with fireproof material; neither has it forbidden the use of wood in subordinate parts of the structure, or wooden palings and gates in residence streets. It does not refuse permission to prolong the life of wooden buildings by keeping them painted, or by stopping leaks in the roof, or replacing broken glass When a great number of wires accumulate in a neighborhood, so as to be a nuisance, it is perfectly proper for those who have the welfare of the city in charge, to say that the line must not be rebuilt except under ground. But what is the difference between ordering the demolition of a line of poles and wires, and the demolition of a wooden building because both are liable to endanger adjacent structures in case of fire, and because both are more useful than ornamental?

The idea of putting all the wires in any city under ground throughout their whole extent, is not worthy any discussion—it is entirely impracticable. But in any large city the number of wires in the neighborhood of the exchange is a nuisance, both to the public and to the company, and there is no objection, scientific, mechanical, or economic, to putting them under ground for moderate distances, until they begin to diverge and scatter to reach individual subscribers. In some cases it is absolutely necessary to cable the wires in order to handle them, and there is very little difference in the working of any aerial and underground cables—none at all if they are enclosed in metal. It would be advantageous to use a special conductor for trunk lines and long extra-territorial circuits. This is about all that can be done with the present apparatus, and with our present knowledge of the methods of overcoming the difficulties in the way. It is all that has been done in any place, and all that any body of lawmakers can compel to be done successfully. It is doubtful if there is a large exchange in the country that would not voluntarily do as much when the present pole lines need rebuilding. The most conclusive experiments that have been made, and the most extensive work that has been done, thus far, have not been under compulsion, but voluntarily. It does not seem that, at present, we have sufficient data to say absolutely just what length of wire can be worked under ground. We are sure that the entire system of any large city cannot be put under ground, for good scientific and financial reasons. We are sure that the entire system of any small exchange cannot, for financial reasons alone. We are sure that a general and extensive local adoption of underground wires would prevent long-distance telephoning, except, perhaps, from office to office. On the other hand, we are sure that, when it is required to handle a large number of wires in a small space for a moderate distance, no one need fear any bad results from using underground cables. The only thing we are not sure of is the exact length of a "moderate distance." But it is probable that no trouble would be experienced in any place up to the limit of hundred-wire cables—that is, as far from any office as any hundred wires pursue the same route.

In conclusion, to state our creed, we believe in both aerial and underground wires, without bigotry or intolerance towards either, and with due recognition of a suitable and proper field for the use of each. We do not have much faith in the man who says he can put 2 392 wires in a space $2\frac{1}{4}$x$3\frac{1}{2}$ inches; neither do we expect a lineman will be a necessary feature of every circus of the future, to show people how they used to climb poles in the old days of telephone wires.

The paper was received with applause, and at the close of the reading the association extended to Mr. Patterson a vote of thanks, and ordered the paper placed on the records of the convention.

Okonite Wires and Cables.

The Okonite Company, of 13 Park Row-New York, have lately brought out some striking novelties in the line of high insulated cables of electric conductors, for underground, submarine and aerial lines.

In this issue we will give a short description and illustrations of their new style of underground cable.

This cable has been invented by Mr. J. J. C. Smith, the superintendent of the company, for the purpose of being placed under ground without the use of a conduit.

The manner in which this cable is formed presents several novel points, which together, give essential features of high insulation, durability, strength and comparative low cost.

Fig. 1 presents a perspective view of a short piece of such a cable, which has been opened at one end to show the several layers of which the cable is composed.

Fig. 2 is a longitudinal section of the same; and

Fig. 3 is a cross section of the cable.

The cable consists of seven different layers, each of which has a separate function.

Beginning with the center, we find that it is a flexible tube formed of wire wound in a close spiral the whole length of the cable.

This hollow flexible tube is for the purpose to fill all the interstices of the cable with melted ozokerite, after the cable is laid up and armored.

Round this central tube the insulated conductors are laid in such numbers as desired.

The insulation of the separate conductors is made up as follows: Direct on the wire we find an okonite insulation cover, the insulation resistance of which is over 500 megohms per mile. Then the okonite cover of each conductor is braided over, and the whole number of them laid up in cable.

The cabled conductors are then encased in a solid okonite cover.

This cover has an insulation resistance of several thousand megohms, is absolute waterproof, very strong and elastic.

Outside of the okonite cover we see a metallic foil-cover. Over the foil-cover is a layer of fibrous okonite tape, which forms a bed for the inside armor. The inside armor, consists of a No. 14 galvanized iron wires, laid around the cable in long spiral turns.

This armor, is followed by a second outside armor, formed of No. 8 galvanized iron wire wound in close spirals over the whole.

When the cable is complete in the manner stated, the interstices between the several conductors and the cotton braiding is filled with melted ozokerite or mineral wax, which is forced through the hollow center at a pressure of about 150 lbs. to the square inch.

This fluid additional insulation material escapes through the sides of the central spiral tube and penetrates the cotton fibers filling every interstice to perfection.

The insulation resistance of such triple insulated conductors is very high in thousands of megohms per mile. Although the cable has a double iron armor, it is nevertheless flexible to a great extent.

The peculiarly laid double armor is strong enough to resist the strongest blow of a pick or sustain a great lateral pressure, therefore such a cable can be buried under the pavement of a street without a special conduit.

The ozokerite filling of the cable is not affected by gas, acids or alkaline solutions.

In connection with this cable, Mr. Smith has invented and secured by patents a new system of connecting his cable sections, branching them off at cross streets, carrying branch conductors into every building along the line, and does so without cutting into his cable or disturbing it in any way. Buildings can be connected very readily and without tearing the streets open every time if such connections are to be made.

Mr. Smith states that by the use of his system and cables, electric conductors of any kind can be laid under ground more efficiently durable and at lower cost than by any other system of conduits.

In our next issue we shall give descriptions and illustrations of Mr. Smith's method of connecting, branching-off and distributing electric conductors. The president of this company, Mr. Chas. A. Cheever, has shown great enterprise since he organized it, and his personal acquaintance and popularity in the electrical field has evidently assured him already a very profitable trade.

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EDITORIAL ANNOUNCEMENT.

Address all communications and make all checks and P. O. orders payable to order of ELECTRICAL REVIEW P. O. Box 3329, New York

We invite correspondence from Electricians, Inventors and the Telegraph and Telephone fraternity and those engaged in Electric Lighting on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

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Mr. J. Viennot, 150 South Fourth Street, Philadelphia, is our accredited representative for Pennsylvania.

Mr. C. C. Haskins, 118 LaSalle Street, Chicago, Ill. will represent the REVIEW in the West.

Messrs. Wm. Dawson & Sons, 121 Cannon Street, London, England, are our representatives for Great Britain.

NEW YORK, SEPTEMBER 26, 1885.

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General Manager Keller, of the New England Telephone and Telegraph Company, is succeeding in raising the rental for telephone sets throughout his territory with much less trouble than was anticipated.

We print in another part of the paper a full account of the Erie Company's meeting at Albany, which will prove interesting. The stand taken by Mr. Dickinson is one which many stockholders will approve of. The unnecessary meetings, continual cry of poor property and the bringing of suits which can never amount to anything, are having its effect upon the stock. The suggestion made that the directors give more time to looking after the company's business is a good one. The Pan-Electric Company, in Texas, seems to be cutting into the Erie Company's business very rapidly.

At Fort Worth, Dennison, Dallas, and other important places, the Pan Company have exchanges in operation, and with local capital and influence are fast displacing the instruments of the older company; and if this thing continues another year the Southwestern Division of Erie will be a dead letter.

Mr. Frank Harrington, who succeeded Col. G. L. Beetle with the Western Electric Company, proves himself a capable successor to that genial gentleman, and was one of the most popular attendants at the Telephone Convention.

The damage done to the Telephone Exchange, at Charlestown, S. C., by the severe tornado of several weeks ago, will amount to $4,000 or $5,000. The exchange was closed for three weeks, while repairs were being made, but the first of last week was opened for business.

In view of the present movement on this side of the Atlantic to bury the electric wires in cities, an illustrated article in a late number of the *Scientific American*, showing the method of laying underground cables in Paris, is of special interest. There, as is well known, the telegraph wires have for some years been laid through the sewers. The aerial lines having become intolerable alike to the telephone companies, or rather to the "Societe Generale," into which all the early companies were merged, and to the house owners, notwithstanding the fact that the latter were allowed by Government to charge a rental for the use of their house-tops, the city of Paris at length opened its sewers to telephony, as it had already done to telegraphy.

In those vast conduits, which have long been traversed by curious visitors in either boats or cars, the workman, specially shod for the occasion, proceeds swiftly and without interruption with his work. Considerable difficulty was found at first in the construction of the cable, as "the induction was such that a conversation transmitted by one wire was heard in the contiguous one with an intensity equivalent to that of a direct conversation." This, however, was soon remedied by the employment of two simple conductors for each line, while, as a further precaution, the wires "were twisted together loosely and covered with cotton of one color."

The labor of laying the wires is vastly less than on the aerial lines, while to the citizen the annoyance is inappreciable.

TELEPHONE IN FRANCE AND BELGIUM.

From our French contemporaries, we learn that M. Dauderin appears in no hurry to begin the installation of the system of telephony of which at Paris he obtained the concession. It was not until last week that he attended to the matter of the cautionary bonds of 370,000 francs exacted for the use of this concession.

It seems to be the first and only manifestation he has given that he is alive to the importance of the matter, and if he continues to hasten as slowly as this, the end of the concession, September, 1889, may arrive without having seen the public profited by the superior service he has so often promised.

The condition of the telephone service so far as it has been exploited by the State in the Northern sections of France is as follows:

	Subscribers.
Lille	146
Roubaix (interior	163
" (exterior)	4
Tourcoing (interior)	105
" (exterior)	8
Dunkerque	88
Armentieres	12
Holluin	10

In Belgium the popular demand for telephonic service has at last produced something like energy on the part of the authorities.

The installations of the telephone-post must be capable of transmitting words to a distance of 200 kilometers to a receiving office along an aerial line composed, 1st. Of a circuit 180 kilometers in length, formed of two iron wires of a diameter of 4 mm on the plan of the system of Van Rysselberghe. 2d Two wires each of 10 kilometers, joined to the two extremities of the preceding line by the intermediary of two telephonic translators, and of two annunciators.

THE AUDIENCE PHOTOGRAPHED BY AID OF THE ELECTRIC LIGHT.

The interesting operation of taking a photograph of the interior of a theatre with the audience seated, using the electric light for illumination, was undertaken and brought to a successful issue last Wednesday evening, at the Novelty Theater, Williamsburgh. The auditorium of this play-house is of moderate size, having a capacity for seating about 1200 persons. Nine arc lights (Thomson-Houston) of 2000 candle power each, were strung across and just in front of the stage between the boxes at a height of about twenty-five feet, and twelve more were arranged around the rear of the house between the balconies and over the parquette. These lamps were supplied with white paper reflectors, so placed as to concentrate the light where needed. At 10 o'clock Mr. Theall, one of the proprietors of the theater, stepped upon the stage and announced that it being the seventh anniversary of the opening of the Novelty Theater, the management desired to commemorate the fact to the minds of the people of Brooklyn, and had arranged with Mr. H. W. Biffar, of Williamsburgh, photographer, to take an instantaneous photograph, during the performance, of the entire audience; each face, Mr. Theall stated, would show distinctly, and a souvenir copy would be presented to each person occupying a reserved seat. He requested that all should remain quietly in their seats—as this was between the acts the solemn import of the request to some of our male brethren can better be imagined than expressed. Four plates were used, each being exposed about 28 seconds. To attain success in the undertaking it required much more thought and care than would be readily imagined, and in view of the fact that it had been pronounced an impossibility, except by the use of a very large number of lamps, the credit due Messrs Cooper & DeMunde, of the Municipal Electric Light Co., who managed the introduction and arrangement of the temporary installation of 21 lights, is all the greater due to their enterprise and persistence.

However, this is but another example in the very gratifying record of the Municipal Company, in which Messrs Cooper & DeMunde figure as the apostles of light.

During the past four months, the period during which the company has been in operation the number of lights supplied, which was quite large at the start, has been nearly doubled. Their model central station is at 810 Penn Street, and a large airy one it is. The plant consists of three steel horizontal tubular boilers of 100 H. P. each, four 50, and one 90 horse-power Buckeye engines, coupled up to five 45-light and five 30 light Thomson-Houston machines in pairs. Additions to this plant are now in progress.

The Municipal Company supplies light as far even as Greenpoint, L. I., lighting Manhattan Avenue on a circuit which contains between 8 and 9 miles of wire. The principal streets of Williamsburgh are lighted by the electric light supplied by this company, using the 1200 C. P. Thomson-Houston lamp. The electric light is growing more and more popular every day under Mr. Cooper's excellent guidance.

ELECTRICAL PROGRESS IN SPAIN AND PORTUGAL.

We hear constantly of electrical work that is being accomplished in England, France, Germany and even Russia, but nothing of that done in the Spanish Peninsula and Portugal. Yet these people awoke long ago to the importance of applied electrical science, and they are doing no little to advance and encourage its development. In the near future it is likely to prove a good field for American electricians and American materials. We are informed by our Spanish contemporary, *Industria E Invenciones*, that preparations are active to introduce the electric light in several cafes and clubs in Madrid, both arc and incandescent. The Brush light, our contemporary says, is the one that has given the most satisfaction. We suppose it means by this the Brush-Swan light.

In Portugal the cafes, clubs, hotels, factories and promenades are lighted by gas alone, the only electric light yet introduced being placed upon the ancient Tower of Balem, on the Tagus. Here there is a Siemen's dynamo electric machine, fed by steam power. The light itself having an intensity of 10,000 candles, projects its rays upon the entrance to the Tagus, and at night a splendid view is given of the ships in quarantine, and the great sanitary establishment, situated on the left bank of the river, opposite Lisbon. This unique installation produces a grand effect by reason of the commanding situation it occupies on the majestic monument or tower. At the entrance of a port like Lisbon, where without ceasing arrive fleets of ships from South America, and, in consequence, where a great quarantine is permanently established, the electric light has proved of extraordinary advantage; and such lights should, and, we understand, will be established in every harbor on the Portuguese coast from Lisbon to Oporto.

But if in Portugal we see only one electric light to-day it makes up for the omission by being far advanced ahead of Spain in the progress of the telephone. Notwithstanding the obstructions introduced by the Government in the way of taxes and imports on foreign telephone companies, and other difficulties of which the foreigner can form little idea, the Gower telephone has been introduced by an English company, and is making great headway, there being already something like a thousand subscribers at Lisbon, and about three hundred at Oporto. It would already have advanced much further, but being in the hands of the Government, it is retarded by the inexperience and timidity of the officials.

The electric light situation in Spain is curious. Having no patents herself, societies have been established to exploit the French patents, and has permitted an English company to establish itself upon her territory. This company has purchased the rights for the Brush machines and lamps. The number of installations are not at the present writing very large, but the future has great promise, for the lights are giving great satisfaction.

At Saint Sebastian, notably, there is a fine installation, and one, too, which has attracted much attention. Upon the grand promenade of the Alameda there are 16 lights placed in two parallel lines, coming from a single machine placed in a little house behind the market. During the autumn and winter the lamps thus placed will be kept aglow for eight hours. But in the spring, when the fine season commences, the strangers arrive and the fetes begin, it will be necessary to change the position of the regulators and to light a certain part of one avenue at one time, and a certain part of another at another time.

In the squares, in the principal streets, upon the plaza, the masts for lighting are fixed, and remain to throw a flood of light upon the adjacent waters, where there are fetes every evening.

At Bilboa, and at Santander, the Brush Company have arranged installations.

At Madrid the Sociedad Matritense Electricidad is the only company yet dispensing light. Founded three years ago with Spanish capital, and made up exclusively of Spaniards, it has seen itself grow little by little in importance. At first it began with an installation on the Prado, where Gramme regulators were used upon summer nights, the steam power coming from the little factory of the Retiro garden. These first efforts having met with success, an effort, and a successful one too, was made to extend the installation, and to-day the installation, both underground and aerial, includes a great portion of the capital of Spain. The society, exploits the Gramme and Maxim systems, the Maxim incandescent light having given greater satisfaction than any other incandescent light. All the material necessary is made at Barcelona by the parent society, the Sociedad Espanola Electricidad. A branch society, the Sociedad Matritense, has created at Madrid two central factories, whence the regulators placed in the city are fed. The two installations are situated, the one in the gardens of the Buen Retiro, and the other in the Park of the Minister of War.

GENERAL WESTERN NEWS.

Mr. F. S. Terry, Western Manager for the Electrical Supply Company's establishment here, has just returned from a long sojourn East, and is as full of business as Mexican history is of governments.

Well satisfied with the Chicago venture, which was at first cautiously made, the company is now enlarging its field of usefulness, and greatly increasing its stock, a move which Mr. Terry's popularity and genial disposition has rendered a necessity.

The company, in addition to a general assortment of insulated wires and cables of various manufacture, makes its own electric light carbons, which are the result of an immense amount of expensive experimenting, and which are now claimed to be perfect. These are of different mixtures, as well as varying density, to adopt them to the various systems. Callender wire and cables are specialties also, and in iron wires they show the Robeling product.

They have just now, in accordance with an increasing demand, after some hesitation, concluded to launch into the bell-hanging supply business, so that with Patrick & Carter's annunciators, Bogart's lighting apparatus, Diamond Carbon battery—an improved and perfect form—there is no reason why they cannot furnish a complete outfit for anybody's cot, castle or cathedral.

The evidences of their financial success here are abundant and gratifying, and they will hereafter keep a full and complete stock of everything in their line, at Chicago.

Last week's pleasant weather seemed to be just what was wanted by the wire groundhogs—a sort of Michaelmas week among the telegraph, telephone, cable and underground people. All along LaSalle street from Lake to Jackson, at the various manholes, which were open, crowds of idlers surrounded the busy workers in the electrical field. At one point Patterson was superintending the joining up of cable terminals, here a gang of men were pulling out with a recklessness indicative of anything but care, a cable for which a telegraph company had no further use; farther on the Kerite people with a little furnace, were soldering and vulcanizing joints, while close at hand, leading wires were being shoved through the conduits by a machine constructed for the purpose. The wisdom of the by-standers, as evinced by their remarks, would do credit to the teacher of a three months' summer school in a backwoods district.

One chap said that they were cleaning out the sewers. Another believed that some sort of surveying was being done preparatory to running a line of levels for an underground railway, while another knew, because his cousin was in the public works department, that it was preliminary to lighting the streets of Chicago with kerosene to down the gas companies, the conduits to be filled with kerosene, and tapped at all the street lamp posts.

Three fire-alarm boxes at the Western Electric establishment show very perfectly what an electric light current can accomplish, when circumstances are favorable. These samples of its handiwork are from New Orleans, sent up for repairs. The repairs required will amount to a complete renewal of the entire "innards," in each box. The case is similar to a conflagration where a green insurance agent reported a loss to his company. After detailing at great length the particulars, he wound up with a "P. S.—We saved the lot, and part of the fence."

The police telephone and signal company of this city have just finished and put their system in working order at Grand Rapids, Mich., to the great joy of the authorities, and wonder of the average inhabitant. The outfit consists of one central station, two circuits and fifty-one boxes.

The local newspaper, the *Leader*, in the exuberance of its glee, announces that: "The Valley City always has had the reputation of occupying a bald-head-at-the-ballet seat in the Theater of the World, and this time she is preceded only by such cities as Chicago, Milwaukee, New York, Boston, Detroit and Philadelphia in presenting her coupon ticket and calling for the usher." The editor also claims that "Grand Rapids is the first and only city in the country, of less than 100,000 population, to adopt this latest improvement in preserving good order." It is impossible from so far away, to read the particular census report used by the gentlemanly editor, but that which we have here in Chicago, says that neither Joliet, Hyde Park, in this State, Allegheny City, Pa., Lynn, Mass., nor New Haven, Conn., are credited with that population—yet they all have the system complete and in perfect operation, and have had for some time. Due allowances must be made, however, for the era of good feeling which evidently pervaded the entire community at the time the article was written, and its influence on the writer's mind

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The prosecuting attorney at Evansville, Ind., is creating considerable sensation by his action in telephone matters. Several suits have been brought against the Cumberland Company, and Superintendent Masters has been arrested in half-a-dozen cases. Wherever it can be found that the company has charged in excess of the legal rate—$3 per month—an affidavit will be filed and an arrest made. To obtain testimony, every subscriber will be summoned and ordered to produce the company's receipt. The affidavits are filed against Oscar C. Harding, the company's collector, who was recently arrested on four warrants and placed under $50 bonds in each case.

The Chicago Commercial and Financial News Company, of whom mention was made in these columns some time since, have so far progressed as to open an office for regular business. It will be remembered that this is a company not unlike the Gold and Stock organization, for the same purpose. With a new form of ticker, by which, it is claimed, three times the speed is accomplished, and a duplex wire to New York, in addition to facilities in other directions for general market reports, and the best of feeling toward them existing on the part of the market quotations bureau of the various boards of trade here and elsewhere, they claim that the outlook is everything desirable. They are located in the northwest corner of the old Board of Trade building on La Salle and Washington, only a light partition separating them from the branch office of the Baltimore and Ohio Telegraph Company. As the Western Union and the Gold and Stock are directly across the street, it will be in order for the two combinations to make faces and throw looking-glass reflections in each other's eyes during sunshiny days when business is dull.

Our neighbors in Milwaukee are struggling fearfully with the electric light question. An electric lighting company has been endeavoring to arrange for lighting a portion of the city, and an ordinance has been before the Council several times to that effect. It has been constantly amended, and petitions against it have been used to its disadvantage, while the wrangling between its advocates and assailants has been severe in the extreme. On the 14th instant it was again before the city's lawmakers, and finally progressed as far as a third reading. Combined with the permit to run wires is an underground proviso, which requires that along the principal thoroughfares wires shall follow the prevailing fashion and go underground. Along less frequented streets they are to be permitted to run on poles. The lamps, it is stated, are to be suspended at street crossing centers on diagonal supporting wires, thus giving the streets in four directions the benefit of the light.

The matter will come up again at the next meeting, which will occur on the 28th inst. The electric light enterprise is a sort of Banquo's ghost. It will not down.

Bloomington, Ill., has for some time had some experience in arc lights. The town has become dissatisfied—not with the lights themselves, but with the number thereof. A local company has been organized, which at the outset was to light the town by the first of November with 100 Thomson-Houston lamps, on suspended wires at street crossings. Up to date the original scheme has been repeatedly changed, until to-day the company will have to put up 145 lights for corporation purposes, while there is every prospect of at least 50 for private use, making a grand total of a couple of hundred lights.

A building will be erected at once, and, if no drawbacks of a serious character are encountered, the plant will be in full blast on contract time.

Col. Lynch, at 144 La Salle, quotes telephone stocks as follows, under date of September 18:

Central Union	$ 53 @ $ 55
Michigan	67 @ 69
Iowa	20 @ 23
Great Southern	50 @ 55
United	15 @ 18
M. & K.	55 @ 57
Chicago	$375 @ $400

Chicago, Sept. 21.

NOT A SINGLE GAS JET.

The old Third Avenue Theater has at length passed into the realms of shadowy remembrances, carrying along with it its trials and disappointments; and the new one blossoms forth under the management of Mr. J. M. Hill, to whom the theater-goers of the country are indebted for many hours of enjoyment.

The old frequenters of this playhouse would not know it in its new garb. The painter and the plumber, the steam-fitter, the decorator, and the electrician have been there, and have had just such a time as did the monkey and the poll parrot; but out of all the apparent confusion has come harmony and beauty, and to-day it is, without exception, one of the prettiest, cosiest little theaters in the country.

Mr. Hill has long ago shown us that he knows a good actor and a good play, and now in this section he gives us a sample of his idea of a theater in which to place them. There is no mistaking he has put his best foot forward in this matter and means to win, and it seems that it would be a day of extreme frigidity when this gentleman would not get these when he starts. It has been his way of doing things. But, of electricity: This house possesses the most complete installation for incandescent lighting in theaters of any not only in this country, but in any other, from an artistic as well as scientific point of view. It would be impossible to do it full justice by pen. It must be seen to be appreciated at its worth. On entering the lobby the eye rests upon an effect in decoration which is, to say the least, unique and pleasing in the extreme. The walls, tinted in a rich, dark color, are studded from dado to frieze with a profusion of flowers of velvet, silk and satin, cunningly made and artistically placed, their colors blending in perfect accord; and more—hid within the petals of the rose, the lily, and all this glorious array, shining forth their soft, mellow light, are hundreds of tiny glow lamps, lit by that most perfect handmaid to art—electricity.

These lamps are new in series, in separate circuit, and range from $\frac{1}{4}$ to 1 candle-power. As we pass on into the body of the house, one is struck by the fact that whilst the illumination is perfect there is a certain restful character to the light which we do not find in the light from gas under any conditions. The furnishings, which are here rich as well as tasteful, appear all the more effective under this soft, dreamy light. At the center of the ceiling of the auditorium is set the grand chandelier, containing a large number of the Edison 16-candle power lamps all aglow, and the effect is extremely fine. All through the body of the house, at the back of the parquette, in the balconies, everywhere we turn, the eye meets these incandescent lamps, in clusters of three, four and five, in brackets and in chandeliers. The footlights are Edison glow lamps, also those around the arch of the proscenium, and, most important of all, the border lights, far up among the combustible scenery, give assurance of safety from fire—in fine, not a gas jet is used in the house!

Right by the side of the stage-manager's desk, stands the electrician, Mr. A. B. Murray, and from here he controls the lights of the whole house, raises or lowers them at will, cuts out part of a circuit or all of them, plunges the stage or house into darkness, and as suddenly illuminates it again, and all in an instant and with the utmost certainty.

The most effective arrangement of light is thus rendered possible, as was frequently evinced during the evening's play in a very novel manner. The lights are arranged in three circuits, one containing all the border lights, 110 in number; another the foot lights, in which there are 46, and those of the arch, containing 32 lamps; the third circuit comprises all the lamps in the body of the house. There are in all 400 16 candle power lamps.

Several 50 and 100-candle power lamps are used for special purposes on the stage The raising or lowering of the lamps is of course accomplished by throwing resistance coils into or out of circuit. In a separate portion of the building is located the engine room; the plant consists of a horizontal tubular boiler, and a 50 horse-power New York Steam Safety Power Co.'s engine, driving a 600 Light Edison Machine of the Edison-Hopkinson pattern. The engineer is supplied with red and green glass pilot lights, and a set of resistance coils, with which he can regulate the supply to the mains. The installation has proved a complete success, and in speaking with Mr. Thos. Hogan, the decorator, he expressed himself highly pleased with the effect he had obtained by means of the electric light. To Mr. John H. Campbell is due the idea so artistically carried out by him in the lobby, making use of the small lamps in the manner mentioned above. The cost of this installation has been large, but it will no doubt give value received in the near future. Mr. Hill deserves much praise for the liberal manner in which he entered upon and carried it on to completion. It is a move in the right direction, and his lead will doubtless be followed by other metropolitan managers. It would be safe to predict that the day is not far off when all of our theaters will be lighted entirely by the incandescent light.

THE AMERICAN ELECTRIC MANUFACTURING COMPANY.

Papers were executed on Thursday last between William H. Appleton, president of the Fuller-Wood Electric Light Company and Edward H. Goff, president of the American Electric Manufacturing Company, by which the latter corporation secures the control of the Fuller-Wood system of electric lighting, with the new five-story factory on West Eighteenth street, which is pronounced one of the best and most completely equipped establishments for the manufacture of electric lighting apparatus in the country, the machinery being all of the most improved character and entirely new.

This contract carries with it the full control of all the latest inventions and improvements made by Professor Wood, which are said to be of great value, and when put into practical use, will supersede all of the old Fuller patents.

President Goff was seen at his Fifth avenue office, and asked regarding the action of his company in abandoning the Thomson-Houston system, which he has worked so long and successfully to establish. He said he had nothing to say against the latter system, for which, and for Professor Thomson, its inventor, he had the highest respect, but that he considered it for the advantage of his company to adopt the new system, because, first, it is fully as economical to build and profitable to operate as any other; and, second, because it would enable the American Company to be independent of all other corporations and to derive the entire profit from the manufacture and sale of the apparatus. He said he expected to run the New York factory to its full capacity in manufacturing dynamo machines, and that the lamps will probably be made by the Electric Development and Manufacturing Company of Boston, whose factory is fully equipped for this kind of work, and which is principally owned by the American Company.

It is understood that this latest combination brings a large amount of new capital into the American Company, and that the business will be pushed with greater vigor than ever. The company claims to have orders now on hand for over $200,000 worth of new apparatus.

Telephonic News

⁂ The United Telephone Company is putting up a line 65 miles in length, to be constructed entirely of iron poles. The line starts from Wichita, Kansas.

⁂ Telephone users at St. Johnsbury, Vt., are protesting against the attempt to raise telephone rates. Over forty subscribers out of seventy have pledged themselves to have their instruments removed if the advanced rates are insisted upon.

⁂ The Buffalo Telephone Exchange is now connected with several points in Canada. There is no Government duty on the messages, but there is a toll that the telephone companies do not neglect to collect. The line crosses on the bridge at Buffalo.

⁂ Just now inventive genius seems to be running in the direction of underground cables for telephone and other electric wires. We trust that out of the abundance of these may come a system practical and inclusive—capable of containing all the wires, and yet none interfering.

⁂ At Norristown, Pa., the telephone exchange is not very large, but averages 300 calls a day. When we consider that each call represented a business matter that would require either a telegram, letter or personal visit on the part of the persons transacting the business, we see the great benefits derived from the use of the telephone. Business men there could scarcely do without it, now that it has come into such general use.

⁂ At the telephone convention, Capt. Stone, of Cincinnati, was called upon to explain his adventure with the "kicker's" desk, an account of which had just appeared in the REVIEW. The captain says that the visitor when he found that he was numbered among the kickers, took it good-naturedly and hoped to be able to get back to the general switchboard by good behavior, coupled with the information he had received through his visit to the exchange.

⁂ The custodian of the "Old Guard Electrique" was recently heard making the following remarkable soliloquy: "Once in a great while something comes stealing across the vision like a passing angel, having with it the odor of strong flowers, plucked by unseen hands, in unknown countries far beyond the earthly seas. We do not understand it, cannot fathom it, yet we know that it must be a thing of joy and beauty." It must have been a very elegant and seductive brand, possibly *Chateau y Quem*. Don't keep us waiting, Fred.

⁂ Over in England, the American Bell Telephone Company is called the "Octopus." One exchange, the *Telegraphist*, has the following concerning the new Thomson telephone: "At last a formidable opponent to the city Octopus has appeared. Professor Sylvanus Thompson's new telephone can be purchased without fear of legal proceedings For £16 any person can buy two sets of transmitters and receivers. The disgraceful monopoly is now at an end. In the new telephone there is no infringement of the patents held by the United; therefore the directors and shareholders of that company will have to alter their tactics, or they may soon be driven out of the field. In the new transmitting instrument the rise of a tympanum to catch the sound of the speaker's voice is obviated by the employment of a funnel-shaped tube, and instead of the tension-regulator of cabon-button used by Edison there is a metallic ball valve. This combination of a speaking-tube with a ball-valve to control the electric current is one of the most novel points of the new invention, and is as simple as it is novel. A form of guarantee by the company against any claim by trade rivals for alleged infringement will be given to the purchaser of any telephone requiring the same, and the company will indemnify the purchaser against any such claim, and defend any action brought."

⁂ The hello girl in a telephone exchange ought to have a pretty good idea of what the public ear has to endure. Day in and day out she has poured into her ear a mass of talk that is well calculated to set an ordinary mortal crazy. There is usually a large percentage of sense in what she hears, while the reverse is true of the public ear. Cranks, light-weights and addleheads pour the largest quantities into the public ear. It is light, cool and free from any positive qualities, yet it palls, dulls the sense and leads to the conclusion that there are circumstances under which deafness may be a blessing.—*Ex.*

⁂ The telephone men were in Doylestown on Wednesday, repairing the line and attending to defects. The service is now quite fair, and generally satisfactory. When it is more thoroughly extended it will become indispensable. In our neighboring counties of Montgomery, Delaware and Chester we notice that the telephone is rapidly pushing its way into country districts, and that many farmers are among its patrons. We have in mind a farmer six miles away from his market, who, the the other day, made a sale by telephone and had delivered his goods by the time some of the near-by producers were astir. The Doylestown Exchange will soon be connected with all the towns on the North Pennsylvania Railroad. Next we want to be put within speaking distance of New Hope, Newtown and Bristol.—*Intelligencer.*

⁂ The American Bell Telephone Co.'s suit against the Pan-Electric Telephone Company and Washington Telephone Company of Maryland, using the Pan-Electric or Rogers' telephone, was postponed last week at request of defendant 30 days, and a restraining order issued by the United States Circuit Court to prevent further infringements on the part of all the defendants. It was supposed by the Pan-Electric or Rogers' people, that the suit filed at Memphis, the home of Rogers and the parent company, by Attorney-General Garland in behalf of the United States would have some effect upon the judges, but it seemed to have rather a contrary influence. Attorney-General Garland is one of the incorporated directors of the Pan-Electric Company and owner of 10,000 shares Pan-Electric stock.

⁂ Out of ninety-one telephones in the Augusta, Me., Exchange of the New England Telephone & Telegraph Company, 49 have already been taken out on account of a rise in rates. At Gardiner, 22 of the 65 in the exchange have been removed, and a large number of others are expected to be ordered out.—*Maine Exchange.*

⁂ A galvanometer has been fitted up in the "testing room" of the Buffalo Telephone Company, and hereafter it will take a pretty oily piece of trouble that can't be located with at least an eighth of a mile on any of the numerous long lines coming into the exchange. This galvanometer-test is the best that can be made, and the recent very satisfactory results obtained at Chicago proves how valuable it is even when all other methods of finding the trouble have been tried and found unavailing. There should be a boom in galvanometers now until all exchanges of any importance are supplied.

⁂ The injunction which was granted by Vice-Chancellor Bird, was issued out of the Court of Chancery. The writ enjoins the Metropolitan Telephone and Telegraph Company, and the New York and New Jersey Telephone Company from removing or attempting to remove the telephones now in the possession of the Domestic Company, and from refusing to deliver to the Domestic Company such additional telephones, instruments and apparatus as the Domestic Company may require for the extension of their business, and from interrupting communication between the Newark district and other districts; and from establishing a district telephone exchange, and from building, erecting and maintaining telephone lines of wires, poles and fixtures in Newark, Harrison and Kearny, for the purpose of using the Bell telephone, or any improvement or modification of the same, and from interfering in any manner with the business and property of the Domestic Company in said territory, until the courts shall make order to the contrary. It will be seen that the Domestic Company are maintained in full enjoyment of all their rights and privileges by said order, and it is understood that service with outside exchanges which has been heretofore interrupted by the rival companies, will be improved, and all orders for telephones will be filled.

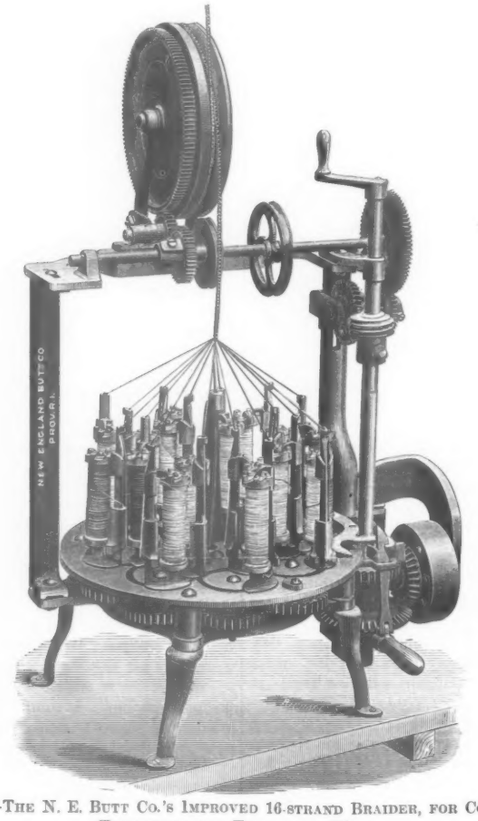

FIG. 1.—THE N. E. BUTT CO.'S IMPROVED 16-STRAND BRAIDER, FOR COVERING TELEPHONE AND TELEGRAPH WIRE.

Braiding Machinery of the New England Butt Company.

The New England Butt Company, of Providence, R. I., operates a factory occupying some two acres of ground, and employs a large number of men in the manufacture of all kinds of braiding machinery, as well as numerous novelties, some of which are coming into universal use Among these we mention a new door lock, which opens by pressure of the thumb on the end of the knob. It is very convenient, simple and reliable.

The illustrations in this edition will give an excellent idea of the appearance of the braiding machines, manufactured by this company for covering all classes of electric wires. Fig. 1 is the improved sixteen strand braider for covering telephone and telegraph wire. It is especially designed for covering or insulating smaller sizes of wire, say from No. 12 to 24, and for this purpose is made in both small and large gear. Fig. 2 is the improved double braider, designed for covering wires with two thicknesses or layers of braid for insulation. Fig. 3 is the improved double braider for heavy work. This machine is for the heavier numbers of wire for electric light. In this machine the tanks for the solution are represented, and the operation is as follows:

The wire is pushed up through the machine and lower tank, which covers the wire with the solution at the same time, and after leaving the tank a braid is laid on; it then passes up through the upper tank, where the second solution saturates the braided wire coming from the lower machine; then on top of this the upper machine lays on a second coating of braid. The process beyond this is drying and polishing by any of the well known methods.

Erie Telephone Company.

SPICY MEETING AT ALBANY.

At the request of numerous readers we present herewith a very full account of the recent meeting of the Erie Telephone Company, at Albany.

A special meeting of the stockholders of the Erie Telegraph & Telephone Company was held in this city last week, there being present from Lowell, J. W. Bennett, Francis Jewett, Charles E. Adams, A. W. Sherman, Charles L. Knapp, W. R. Bachelder and Charles J. Glidden. J. W. C. Pickering of Manchester, N. H., M. F. Dickinson, Jr., of Boston, representing himself and other stockholders, constituted the entire number of gentlemen present.

Mr. Bennett, the president of the company, occupied the chair, and Mr. Pickering was chosen secretary *pro tem.*

President Bennett on calling the meeting made the following remarks:

"As president of the Erie Telegraph Company, I would like to make a statement to the stockholders here at this meeting to-day—the reasons that you are called together. This meeting of the stockholders of the Erie Telegraph & Telephone Company has been called by vote of the directors of the company, to see what action, if any, the stockholders will take in relation to the purchase in the summer of 1883, by those who were then directors and executive committee of the corporation, of the properties known as the S. E. Dakota Telegraph & Telephone Company and the Arkansas Telephone Company. The former was purchased at an expense to this company of $77,000, and the latter at an expense of $50,000, making in the aggregate a sum of $127,000. In the light of subsequent experience this was an exorbitant price for the properties and far above their real value. Recent investigations have disclosed the fact, that the officers of this company making the purchase of these properties were pecuniarily interested in them. They thereupon appointed a committee, consisting of the president, Messrs. Jewett and Adams, to investigate the transactions. This committee consulted counsel and laid all the facts in their possession before them, and were advised that the company could, by legal process, recover any and all sums which the company had lost by reason of the transactions relating to the pur-

chase of the Dakota and Arkansas properties; but they were advised that, under all the circumstances of the case, a meeting of the stockholders should be called to take action in the matter, and if thought advisable to give the necessary authority to commence and prosecute legal proceedings against any and all parties who have received any money or property belonging to this company in connection with said purchases. The counsel employed by said committee have prepared certain votes, which they claim should be passed by the stockholders as a basis for legal proceedings, and which will be offered for your action.

After President Bennett's address, C. L. Knapp and Charles E. Adams were appointed a committee to ascertain the number of shares represented, and also if a quorum of the stock was represented.

At this Mr. Dickinson called attention to the fact that Mr. Charles J. Glidden, the secretary and treasurer of the company, who was present at the opening of the meeting, had retired without explanation, and stated that he regretted this very much, as he wished to have Mr. Glidden present to corroborate the statements of the facts which he expected to make at a later stage of the meeting.

It was stated by the president that as Mr. Glidden had had part in the transactions of the Lowell syndicate, it was thought better that he should not be present at the deliberations of the meeting.

Mr. Sherman said he thought Mr. Glidden claimed, that though he participated in the profit he did not actually help to make the purchases, except as far as the vote went.

Mr. Dickinson rejoined that the remarkable feature of this was that Mr. Glidden didn't always claim so.

It was agreed to, that the committee be allowed to report at a later stage of the meeting, as to the number of shares represented, it being evident that there was a quorum of the stock present.

Mr. D. W. Cowdery then offered the following resolutions:

Resolved and voted, That James W. Bennet, Charles E. Adams and Francis Jewett, all of Lowell, Mass., be and they hereby are appointed and constituted a committee of this corporation, and are hereby authorized and empowered to make full investigation into all the matters and circumstances attending the supposed purchase and conveyance to this company of the Southeastern Dakota Telephone & Telegraph Company and the Arkansas Telegraph Company, either or both of them, and into the action of the board of directors and any or either of said directors, and any other officer or agent of this company, as to either of said companies, as to all payments made on account thereof, and into all arrangements and settlements thereto; and if, in the judgment of said committee, any wrongs have been done to this company, or any money or other valuable things ought to come to this company on account of the premises, or in consequence of any part thereof, then said committee are authorized, in the name and behalf of this company, to employ counsel and to cause to be brought and prosecuted such suits as they may be advised are necessary and proper to recover for the wrongs done, and to reimburse the company for all losses and injuries because of the premises.

Resolved and voted, That said committee be, and acting by a majority thereof are, authorized to make due acquittance and discharge for and in compromise and adjustment of the wrongs done to and suffered by this company in the premises, by and with all persons having had dealings in the premises with this company, this company hereby ratifying and holding valid all the legal acts done by said committee in the premises.

Resolved and voted, by the stockholders here duly assembled of the Erie Telegraph & Telephone Company, That said committee be and hereby are empowered, authorized and directed, if they shall be so advised, to rescind, annul, revoke, set aside and hold for naught, in behalf of this company, all transactions, purchases, sales, bargains, promises and actions whatever in regard of and in relation to said Southeastern Dakota Telephone & Telegraph Company, and said Arkansas Telegraph Company, or either of them, and to hold invalid and void all acts, resolutions, doings and transactions of the board of directors of this company in the said premises, as fully and effectually as if each were specifically done by a vote of this meeting; and all acts of said committee in relation to such doings and transactions are hereby ratified and confirmed.

Resolved and voted, That said committee shall make full report of all their acts, resolutions, expenditures and receipts in the premises to the next regular meeting of this company, or special meeting called to hear the same.

They were seconded by Mr. Sherman, of Lowell.

The chairman—Is there any gentleman wishes to discuss this vote?

Mr. Dickinson—Mr. President, I should be very glad if the president of this company or some gentleman here, will be kind enough to explain why it is necessary that this meeting should be held, and especially what particular circumstances there are at this time existing which make it desirable that the meeting should be held and why the stockholders, very many of whom are in Massachusetts, should be brought to this distance at some inconvenience to discuss this question. I confess that I am in the dark in regard to the matter, and from anything that has been said thus far, I am quite unable to learn the particular exigency which called for this meeting now. I should like to have an explanation, and then I shall be very happy to say something on the question if an opportunity presents itself.

FIG. 2.—IMPROVED DOUBLE BRAIDER, FOR COVERING TELEPHONE AND TELEGRAPH WIRES, BUILT BY N. E. BUTT CO.

The President—With the permission of the stockholders here I will say that the directors of the corporation called a meeting under the advice of counsel, for the benefit of the stockholders of the corporation.

Mr. Dickinson—Mr. President, am I to understand then, that that is really the only explanation that can be offered at this stage for the meeting, or that it is thought necessary to offer?

The President—Well, sir, from the records of this corporation it appears that the stockholders on the 22d of June empowered their directors and executive committee to make certain purchases. But at that time there were five directors, and five gentlemen who formed the corporation, and three of them were dummies, and they at that time formed a corporation under the advice of their counsel. The present board of directors consists of ten, I think, and after submitting all the papers and everything in their possession to counsel, this being a New York corporation, they thought it would be proper to call a stockholders' meeting here. I think that covers the whole ground.

Mr. Dickinson—Mr. President, I think perhaps that a little further remark on my part about this matter may draw from some of the gentlemen present some statements which may help me in getting at the information I seek. Of course there are gentlemen here, a number of them, who are much better informed than I am by way of personal recollection, not observation but recollection, of what has transpired in the past history of this company, and I hope that if in anything I say I make any misstatement, or I am found to be in error I shall be corrected as I go on. I regret exceedingly that Mr. Glidden, the secretary and treasurer of the company, who was one of its original promoters, and who is more familiar with its history and its inside workings than anybody now in this meeting, has thought it necessary to retire from the room while this resolution is under consideration. It seems to me most extraordinary that a man who is thought to be a suitable person to occupy the responsible position which he still holds, and who thinks himself fitted for that position, should not have the face to stay here and hear what may be said, and answer such questions as may properly be put to him. But we shall have to try to get along without his assistance.

Now it may not be known to all the stockholders here, but perhaps it is to most of them, just what transpired in the early history of this company. I will endeavor to rehearse some of it from such information as I have been able to gather within the past few weeks by most diligent inquiry, and from which I mean to draw certain conclusions which it seems to me ought to determine the conduct of this meeting. As I understand it, this corporation was formed in the summer of 1883 for the purpose of consolidating two companies, the Northwestern Company, covering most of the State of Minnesota, all the State of Wisconsin, except what had been farmed out previously by the original company, and the Northern Dakota Company. In connection with its formation the Cleveland purchase came up. Perhaps the formation of the company was suggested by the Cleveland purchase. The company was located in New York, although no particular business was done here I think.

At this point the committee made their report through Mr. Knapp that they found 2,640 shares of personal stock, and 25,541 shares represented by proxies present and authorized to vote, making a total of 28,181 shares. On motion the report was accepted.

Mr. Dickinson—(continuing) It has been stated to me that after the consolidation of these companies and the formation of the Erie, a Mr. Dyar was employed to go through Minnesota and look up these various places which had been found out——

The President—Will you please give the date?

Mr. Dickinson—I can't tell the date. In the summer sometime, and to see if they were worth purchasing. The idea was to get them up. I ought to have stated that the consolidated company also included, as I am informed, the Southwestern Telephone Company, which covers the States of Texas and Arkansas. Mr. Dyar, in the course of his investigations in the Northwest, found the Southeastern Dakota Telephone Co., and he thought that that would be a desirable acquisition for him to make on his own account, and he found that he could make this purchase for what he thought was a reasonable sum. He was very desirous of getting into the telephone business independently of the company, and he thought that with the help of one or two gentlemen in the West, Mr. A. S. Temple and Mr. L. W. Ingham, he could carry the enterprise through. He negotiated for its purchase for himself. He never consulted with any of the gentlemen then directors, with Mr. Glidden or anybody else. He negotiated the purchase for himself, and it was not until after this that Mr. Glidden, or any of the gentlemen who were directors of the Erie Company, knew anything about it. Mr. Dyar finally found that he could not handle the enterprise without help from the East. Mr. Jewett assents to that by a nod, and I therefore feel doubly assured that it is correct.

Mr. Jewett—I was sleeping then. I am liable to nod if I get asleep.

Mr. Dickinson—Mr. Dyar finding, as I said, that he could not carry the enterprise alone, invited the Lowell syndicate to join in its purchase, and to run it independently of the Erie. Mr. W. A. Ingham found after consultation with the American Bell people, that they were unwilling to have the Southeastern run as a separate company, for the reason that it belonged naturally with the Northwest division of the Erie, and accordingly Ingham notified Dyar that he or his associates could not become interested in the purchase. That virtually compelled the Erie Company to buy the Southeastern Dakota, or else to leave it entirely out in the cold. After an examination of the territory, the purchase was then made by the Erie for $70,000, and that was the price paid.

The President—Who to?

Mr. Dickinson—The money reached the parties, the whole $70,000, every dollar of it, who sold the property, and not a dollar of it ever went in any other way. I understand and undertake to maintain here, that that statement cannot be controverted, and that not a dollar of the $70,000 ever went in any way that anybody could possibly criticise. It is only about the $7,000 which I am coming to in a moment, that there could ever be any question raised. $70,000 was the price; it stands recorded thus on your books to-day, where you and all men have had opportunity to see it ever since the day of purchase, and where Mr. Jewett, who sits opposite me, has seen it from that day to this, for he was upon the auditing committee, and chairman of the committee, I believe, which passed upon that very item within a few weeks after the transaction took place. The purchase was made for $70,000, and if there is a gentleman here who wants to say that it was not made in perfect good faith, and that it was not supposed by everybody that the property was worth it at the time, then I shall be glad to have him state it.

It is not pretended, and it cannot be pretended, that anybody supposed that $70,000 was too much to be paid for the telephone business in a country which has increased with the most marvelous rapidity in its population and wealth during the last four

or five years, as shown by the census. No other part of the country has shown such improvement and growth, and it was thought to be one of the most glorious fields for this growing business which had been discovered—a business I may say which everybody wanted to get into, which every man was crazy to embark in at that time.

The President—I beg your pardon.

Mr. Dickinson—This is so unless my recollection and common rumor are at fault. I never heard of a man who didn't want somehow to get connected with the Lowell syndicate, so called, in its palmy days three or four years ago.

The President—I beg your pardon.

Mr. Dickinson—No objection was expressed at that time certainly.

Mr. Sherman—I guess you haven't lived in Lowell.

Mr. Dickinson—I noticed they all got in, pretty much.

Mr. Adams—You will find pretty many are not in it.

Mr. Dickinson—And I guess if Mr. Glidden were here he would say that the Lowell syndicate didn't have to run after them either after the purchase was made. It was one of the conditions of the purchase, that Mr. Dyar be allowed a commission of $7,000 for procuring the property. Mr. Dyar was not in any way connected with the company in this matter, and it was voted by the directors that $7,000 should be paid him as commission, which vote stands upon your records to day, and the books of this company which were audited by Mr. Jewett within a few months afterwards, show the whole transaction. There was no concealment about it, the vote was $70,000 to pay for the property, and $7,000 as commission to Dyar. Some of the present directors were at the meeting when the vote was passed.

Mr. Batchelder—Did I understand you, Mr. Dickinson, that Mr. Dyar was not in the employ in any way or shape of the Erie Company?

Mr. Dickinson—I haven't said anything about Mr. Dyar's being in the employ of the Erie Company. I don't know whether he was in its employ or not. If he was, and the Erie directors chose to vote him $7,000 or to pay him $7,000 for any services which he rendered, they had a perfect right to do so, and it was perfectly legitimate.

The charge is made that Dyar divided this $7,000 among seven persons, himself included, two or three of whom were directors of the company. This is the entire charge of fraud so far as Southeastern Dakota is concerned, and all the basis there is for calling this meeting, so far as that purchase is concerned. Now, the fact is, Dyar never agreed with any of the parties to divide the commissions beforehand, and some of the persons who were credited by Mr. Glidden in the pool accounts, with $1,000 each, never knew until more than a year afterward of that fact. The money was never actually paid to them in cash separately, but they were simply credited with it in the pools on account, and Mr. Glidden made payments out of the pools from time to time to various parties as, and when he saw fit. So much for the Southeastern Dakota.

I want to add right here, that if you are satisfied that Mr. Glidden did what you claim, viz.: corruptly receive and divide this $7,000, then I, as a stockholder of this company, protest against his standing in the fiduciary relation of treasurer and secretary any longer; and I ask you what sort of light you stand in before the people of Massachusetts and of the country, who are interested as stockholders in this company, in retaining a man in that position who would do such a thing as that? There must be an ulterior motive for such an extraordinary course. The only gentleman known to me among the seven who are said to have shared this commission, is my personal friend of many years' standing, W. H. Bent, of Lowell, and I have taken occasion to ask him in reference to this matter, and he assured me that it was not until a long time after the transaction itself, that he knew of or was informed that any of them had been credited with a dollar of this commission of Dyar's, and he is a gentleman whose word will be taken here, or anywhere where he is known, as quickly as that of the president of this company, or any other reputable citizen.

Now we come to the other matter to which your call relates, the Arkansas Telegraph Company, which had a line from Little Rock to Hot Springs, and which constituted the entire telegraph facilities between those two points. Mr. Downs had been in Texas looking over the southwestern branch of the Erie Company which had recently been purchased. He returned in June or July, and reported to the Lowell gentlemen that he had purchased the Arkansas Telegraph Company on his own account, but did not state the price which he gave; that his intention had been to run it himself, but that the Erie Company might have it for $50,000 if it desired. He made no pretense that he purchased it for $50,000; nobody supposed that was the figure; nobody knew exactly what he paid; and it was considered at the time by Mr. Glidden and by every man who was connected with it, one of the best purchases that was ever made by the Erie Company. That purchase was made by the directors of the Erie Company for $50,000, and it was afterwards ratified by the stockholders, as was also the Southeastern Dakota purchase.

Now let us see what Mr. Downs purchased in Arkansas. The telegraph business of Hot Springs, a thriving and important place, was entirely in the hands of this company. There was no other line running from Little Rock to Hot Springs. It had an exclusive contract with the Western Union Telegraph Company, valid then and valid to-day, although it has been willfully set aside by the Western Union, by which the latter exchanged messages at Little Rock with the Arkansas Telegraph Company, and allowed it 80 per cent. of the receipts. This was an exclusive contract, mark you, and it was worth 12 per cent. per annum upon the purchase price of $50,000 the moment the sale was effected. Mr. Glidden and the other directors voted to purchase this property because Mr. Downs said it would earn $6,000 a year, and pay 10 or 12 per cent. and not from any expectation of personal profit. No one of the directors knew that Downs contemplated purchasing the property, or knew of the purchase until after it had been consummated by him on his own responsibility. The Western Union willfully broke its contract with the company not long after this purchase, and thus rendered itself liable to heavy damages. Their agent and attorney who went to Massachusetts admitted their liability under the contract, and the old board of directors, had it been left in power, would long ere this have asserted the rights of this company in a court of justice. Mr. Dunbar, the general superintendent of the Erie, went to Massachusetts last winter, and at a meeting of the directors, urged them to enforce their rights, stating that he could furnish plenty of evidence that the company had not broken its contract with the Western Union. It was his opinion that the line was worth $100,000, and would earn $500 per month, net. It seems very strange that, in view of these undisputed facts the directors of this company have delayed so long in enforcing their just rights against their powerful rival. The directors are the proper parties to proceed with such a suit, and they are the proper parties too, I may remark, to institute any suits which may be necessary to recover any moneys which may have been improperly taken or withheld from this company. This meeting of stockholders was entirely unnecessary.

Suppose all that is claimed here be true, why was there any occasion for a meeting of stockholders of this company at this particular time? I will tell you what I think was the reason, and what seems to me is the only conclusion that can be drawn from all the facts and circumstances of the case.

It is a most suspicious circumstance to me, and to everybody it seems to me, who has not some personal bias in this case, to know that there are pending at Lowell at this moment three suits, one by Mr. Bennett, the president of the company, a personal suit, one by Mr. Sherman, a director, and one by Mr. Tibbetts, to recover of certain of these gentlemen—I don't know who the defendants are, I only know that it is the Lowell syndicate, or some of them, I haven't inquired about that—to recover certain sums which the plaintiffs say they have been personally cheated out of by these defendants, in disposing of these telephone stocks; and it looks to me, seeing the representative of the Lowell *Courier* here—

Mr. Batchelder—There is no representative of the Lowell *Courier* here. I don't think the gentleman is speaking to the question.

Mr. Dickinson—I want to show why this vote should not pass, and why I am opposed to it.

The President—Mr. Dickinson, I wish you would not discuss my private business in this meeting.

Mr. Dickinson—I am obliged to.

The President—I wish that you would confine yourself to the stockholders' meeting of the Erie Telephone and Telegraph Company under call.

Mr. Dickinson—I am going to do so. I am going to show that this meeting has been promoted—that is my theory of it, and from the faces which I see present I think I am warranted in saying it, from the manner in which it has been conducted—this meeting has been promoted, I say, for the purpose of creating a little public sentiment, which may be somehow of some value in those suits which are so soon to be tried in the city of Lowell. Now, what I say is this, Mr President, if you and the other directors in this company will show as much zeal and earnestness to enforce your rights against the Western Union Telegraph Company as you do to call meetings of stockholders at a remote distance from the residences of most of the stockholders, for the purpose of authorizing a committee to do what the directors ought to do, then I think that this Erie Company will be a great deal better off. I do not believe in a bird fouling its own nest. The Erie is one of the best telephone companies in the country to-day, if properly managed, and I do not think, as a stockholder, that it was prudent to advertise to the world that the Erie Company had not acquired the excellent properties it thought it had. If the directors had stopped to consider it, or had thought less about their own personal interests and more about the interests of the company, I believe they would have hesitated about bringing this matter before the public. It is a significant fact that notice of this meeting was published as news items in the Lowell papers before the notices were sent to stockholders, and, though the reporter I have referred to may not be a representative of the Lowell *Courier*, yet he certainly represents some paper, and he came here from Lowell apparently under the patronage of the officers who called this meeting, so that whatever report he makes is quite likely to be toned to suit their taste.

The interests of those I represent are to have the stock of this company worth as much as it may be, and I contend that you are taking a wrong course, and depreciating your stock and the value of your property, by advertising broadcast in the newspapers that you didn't buy the properties you thought you did, that the Southeastern Dakota was worthless, and that the Arkansas contract was not valid. And if you think you are going to help your stock by any such process as that, why I can only protest.

The President—It has been known by every stockholder in Lowell for more than a year that the property was worthless and didn't pay a dollar

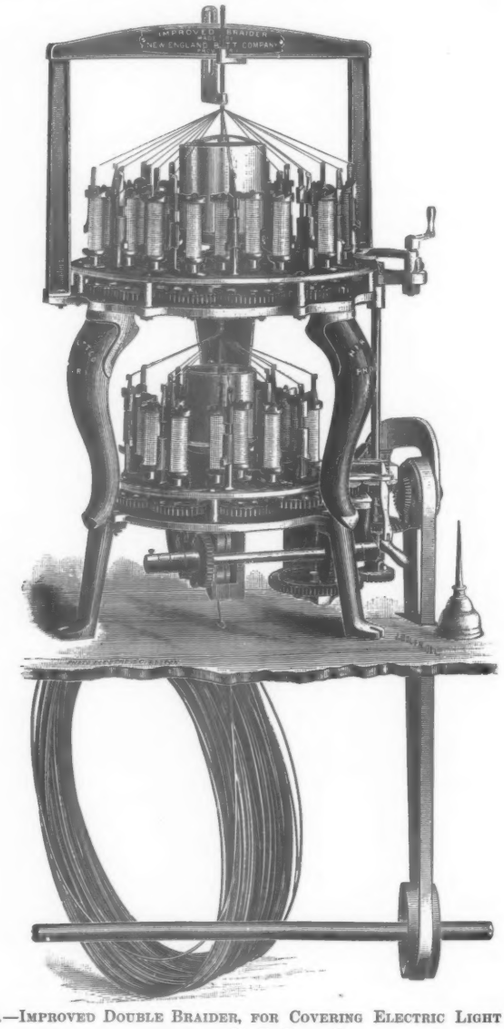

FIG. 3.—IMPROVED DOUBLE BRAIDER, FOR COVERING ELECTRIC LIGHT WIRE, BUILT BY N. E. BUTT CO.

Mr. Dickinson—As I have said, I have the authority of Mr. Brown, the agent of the Western Union, that the exclusive contract is a perfectly binding contract, and could be enforced. And your own superintendent, Mr. Dunbar, urged you last winter in vain to take some action against the Western Union.

Mr. Batchelder—How do you know what is being done there against the Western Union?

Mr. Dickinson—If anything has been done, I stand here ready to be corrected. Do you state anything that has been done?

Mr. Batchelder—I don't state anything about it. I simply said that you are stating things that you don't know anything about; you are standing up here and asserting facts.

Mr. Dickinson—I am not going to withdraw my statement until it is contradicted. It seems to me that there has been an attempt to throw mud at certain very reputable gentlemen. Now, suppose I were to come here and imitate your example, and by inuendo get before the public the fact that somebody in Lowell a few years since, by some extraordinary influence that he had with the city government, persuaded them to erect a bridge at an expense of nearly $200,000 across the Merrimack River, to run out into a pasture—for instance, the Aiken Street Bridge—and it should be so removed from civilization that it could not be found with a spy-glass, what would you say to such a charge as that, gentlemen?

I understand from my friend, whom I have mentioned already, that there was a threat made six weeks ago on a certain Friday, by Mr. Anderson, against one of these gentlemen you complain of, that, if he didn't come up on the next Monday and pay $30,000 or $32,000, he would be sued. He hasn't been sued yet.

Allow me to speak plainly, gentlemen. I think, I say, that you have made a great mistake in coming out here to get a meeting of stockholders at this particular time, and under the particular circumstances. The real motive, although you may be to a degree unconscious of it, is to advance private interests rather than do the best thing for the company. You cannot clothe the proposed committee with any greater powers than the directors already possess under the authority given them by the laws of this State and the by-laws of your company. The conviction is irresistible that the real inwardness of this movement—the secret cause of this meeting, whether or not advised by counsel, as you say—is the promotion of private interests in reference to suits which are now pending and are soon to be brought to trial in the county of Middlesex and Commonwealth of Massachusetts. Against such an abuse of corporate powers I desire to place upon record my firm but respectful protest.

The President—I want to state to the gentleman that he is entirely mistaken. There is nothing that warrants your coming here and making such a statement about my private business. You have referred to the Aiken Street Bridge. The only answer that I have to make in relation to the Aiken Street Bridge is, that I am a citizen of Lowell and a taxpayer, and on a popular vote I think there was but just 387 votes thrown against the bridge.

Mr. Dickinson—Oh, it was well managed, there is no doubt; nobody denies that, Mr. President. Now, what I say is, and this is all I have to say, be as zealous and unselfish for the interests of this company as you are for your own.

Mr. Batchelder—How do you know that we are not?

Mr. Dickinson—I don't see any indications of it; the indications are all the other way.

Mr. Batchelder—Where do you get your indications?

Mr. Dickinson—This unnecessary meeting, called at this time and under these circumstances, is in itself the very strongest indication in support of my statements as to its real motive and purpose.

The resolution was then passed by a majority, and the meeting thereupon adjourned.

* * The New Orleans people are desirous of giving the electric motor a trial on their street-car line.

Oil for Belting.

Editors Electrical Review:

In your issue of August 29th, 1885, a correspondent uses fresh oil for belting, thereby preventing the slipping of the same. If he will use the oil that has dripped from his oil cups on the shafting, or any of the machinery, into the drip cans or cups, he will find that it will penetrate the leather sooner and last longer than new oil. I have used new and old oil for this purpose, and I find that the old oil is far superior, in my estimation, and can recommend it as the better of the two.

Yours, very respectfully,

JOHN A. HADLEY.

September 20, 1885.

—— The municipality of Vazallo, Italy, has recently decided to illuminate the town by electricity, and the streets will be lighted with 70 Cruto incandescent lamps. The current will be furnished by two dynamos driven by a turbine, as abundant water power is at hand in the torrent Sesia. Besides the public lamps, the dynamos will supply from 90 to 100 lamps in private houses.

—— Although the electric light is making its way steadily in every other European country, Portugal obstinately refuses to avail herself of one of the greatest blessings of modern civilization. Her cafés, her hotels and promenades are dim with bad gas, and redolent of the odors which invariably attend the injudicious use of that source of semi-darkness. In that little kingdom there is but one lamp (a Siemens arc), and one dynamo. These are installed in the ancient Tower of Belem, on the Tagus, and serve not only to light up the entrance to the river, but to enable a sharp watch to be kept upon the vessels in quarantine, and the Lazaretto upon the left bank. Electricity against disease. We can only hope that Portugal will further recognize the great sanitary and other advantages attending the use of this luminant.

—— The company which lately placed a plant at the Wauwatosa insane asylum, near Milwaukee, in accordance with a request from the authorities there, has introduced a novel arrangement for regulating the light of the lamps in the hospital and other places where a full illumination is not constantly needed. The desired result is effected in a very simple manner. The apparatus consists of five resistance coils of varying strength, which are cut in or out of the lamp circuit by means of a switch. A sixth contact cuts out the light entirely. The whole is mounted upon a small board which can be fastened on the wall or wainscoting, and is about 6 by 8 inches. The coils are enclosed in tin, and outside this is a wire cloth grating. It is also proposed to use these as heaters for the patients, by attaching them by a flexible cord, so that they may be utilized in a bed, chair, or as a footstool.

—— Mr. Royal Wilson, a colored gentleman who has just been called to the position of head waiter at the Armijo House, because of the illness of the head waiter proper, made a brilliant break the other night. The dining-room of the hotel is illuminated at night by an electric light, and when Mr. Wilson thought that the proper time had come to extinguish the light after supper was over, and there was no further occasion to keep up the illumination, he concluded to put it out. Mr. Wilson was the only man in Albuquerque who didn't know that an electric light could only be extinguished by turning a crank. He was in a state of painful uncertainty as to the proper mode, but finally made up his mind that the simplest way out of a difficulty is always the best. He placed a table under the light and a chair on top of the table, and mounting the latter, he blew, and blew, and blew at that electric light with all the force of his lungs, but it only winked at him in an aggravated sort of way, and invited him to keep up his lick. He did keep it up until his eyes bulged and the perspiration trickled in rivulets from his features. When he was in a state of utter exhaustion he gave up the job in disgust, and said that the light might burn all night if it wanted to.—*Albuquerque Journal.*

—— If the cotton-moth proves as susceptible to the attractions of the electric arc light as other insects, its days as a destroyer in the cotton fields will soon be o'er, as the light is to be tried in the cotton fields and its attractive and destroying powers in this regard put to thorough test.

—— At the Mechanics' Institute Industrial Exhibition, San Francisco, the California Electric Light Company makes a particularly interesting display, not only in its own immediate locality, but also throughout the fair. Besides the regular arc lights, which have proved themselves to be specially adapted for domestic purposes, and which are destined to take the place of gas, the company shows the ingenious device for running incandescent light from arc light circuits, the invention of C. F. Brush. The exhibit is one of the most interesting in the fair.

—— Alcohol from coal gas is the latest discovery, and if the invention of Gobert, Collingridge and Laroche, be successful in practice, another product of the gas-work has been added to the already numerous sources of profit which enable the gas companies to look without alarm upon the encroachments of their electrical rivals. The coal-owner, too, will regard with satisfaction this new demand for his produce; but the exciseman will contemplate with a feeling akin to dismay the possibility of every householder turning on the gas to make grog.

—— Commissioner Mealy has notified the New Orleans Gaslight Company to discontinue over 100 gas lamps in the electric light district. Under the compromise contract with the gas company it must be given thirty days' notice to discontinue lights, and there is an increase in the charge for all the remaining lights. Under this system the lights would not have been discontinued until October. The gas company has, however, written to Commissioner Mealy that it waived the thirty days' notice, and would discontinue the lights at once if located properly in the notice.

—— M. L. Somzee, of Brussels, a representative of the gas industry there, is a claimant to priority in the invention of the incandescent lamp. The patent was taken out on the 5th of November, 1879, at which time it is stated the invention was completed. A second patent, having reference to the form and resistance of the carbon, dated from the 30th of December. It was, then, in the fertile brain of M. Somzee that the incandescent lamp is claimed to have had its origin. This would be a remarkable and unlooked for outcome, if a gas man is to be recognized as the inventor of the incandescent lamp. It would not only be evidence of his "carrying coals to Newcastle," but it would be conclusive proof that the advocate of burning oxygen had at an early date seen the handwriting on the wall—had seen it by the aid of the electric light, not by gas light.

—— It is said, upon what is considered good authority, that the Broadway Underground Railway scheme, regarding which so much has lately been said by the press of New York, is assuming such business-like shape as to insure the building of the road. The enterprise is one of magnitude. The six and one-half miles now under contract, from the Battery to Harlem and its branches, will cost, according to surveys and estimates made and carefully supervised by General George B. McClellan, from $1,200,000 to $1,400,000 per mile. A contract, it is stated, has been let for building the road. Many leading capitalists and business men of the city are interested in the enterprise. The entire structure will be continually lighted by electricity and the trains run by electric motors. The road, when built, is expected to solve the underground wire problem here. It is claimed that arrangements have been made with the Electric Manufacturing Company by which the American Company will control the lighting of the great structure and supply the electric motors, as well as for the control of the rights for placing telegraph, electric light, telephone, fire-alarm and other wires in the structure.

ELECTRIC LIGHT NEWS

—— Messrs. Lawrence & Herkner of New York, have just published a new catalogue illustrating their belting adapted for use in equipping electric lighting stations.

—— Col. H. M. French, general agent of the Ball machine, writes us from Boston that he has just closed a contract with the Cyclo-Rama people of Philadelphia for a 40-light plant Ball system.

—— The Brush people have a very satisfactory plant of about 50 arc lights, at Jamestown, N. Y., besides quite a number of patrons of the incandescent system, using the Swan lamp on the arc circuit.

—— The economy of using the new Incandescent Electric lights in the Boston Post-office, as compared with the former cost of gas in one year's time, has been declared officially from Washington to be over $11,000 saving.

—— The Jarvis Engineering Co., Boston, have shipped a complete steam plant to the island of Newfoundland. The boiler will be set with the Jarvis patent boiler setting. The engine is a 60 horse-power Armington & Sims, running 90 Thomson-Houston arc lights.

—— In Buffalo they complain that the electric lights furnished private consumers are superior to those furnished for the use of the city. The newspapers there very properly inquire why the street lamps do not burn as brilliantly and steadily as those used by private parties.

—— The demand for the electric light in Buffalo is continually increasing. They now have 700 arc lamps in use, and are putting in two more Westinghouse engines. There are eleven of these engines now in use, one extra one in case of an emergency, and the two additional ones will bring the available power up to 14 sixty-five horse-power engines.

—— Operations are in progress at the Island of May with the view of introducing the electric light into the lighthouse, a change which, it is believed, will prove a great boon to mariners. A large coal store is in course of construction, and the foundations of the engine-house are being laid, concrete being used as a basis. It is expected two years will elapse before the whole of the improvements are in full working operation.

—— The result of the recent experiments at the South Foreland lighthouses, in which the relative merits of oil, gas and electricity were tested, is, in the view of the committee which carried out the investigations, to establish the fact that "for the ordinary necessities of lighthouse illumination oil is the most suitable and economical illuminant, and that for salient headlands, important land falls, and places where a very powerful light is required, electricity offers the greatest advantages."

—— Halifax (N. S.) Electric Light Co. has secured the contract from the city for lighting its streets by electricity. Notwithstanding the powerful influence brought to bear against the council by the gas company, 39 arc lights (of the Thomson-Houston system), are now being placed in position in the streets, and it is expected this number will be increased later. The Halifax Electric Light Co. is one of the numerous "offspring" of the Royal Electric Co., Montreal, and has an exceedingly well equipped plant of 100 arc lights' capacity and ten miles of circuit, and besides the contract for street lighting, has a large number of private lights, all under an efficient electrician, Mr. A. T. Smith. The directory and management deserve credit for their enterprise and push, especially when it is considered that it is only one year since the inception of the project in a city hitherto notorious for being considered "slow." Well done, Halifax!

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING SEPT. 15, 1885.

326,123 Electric arc lamp; Richard F. Jones, St Louis, Mo.

326,132 Method of applying Gum-Balata for insulating wires; Peter C. Matherson, Landisville, N. J.

326,158 Electric signaling apparatus; Frederick G. Sargent, Westford, Mass.

326,207 Electro-magnetic log; Lorenzo Bragg Favor, and Charles Augustus Jacobs, Gloucester, Mass.

326,223 Automatic stop apparatus for motors driving dynamo-electric machines; Oscar F. Jönsson, Stockholm, Sweden.

326,237 Electrical conductor for railways, &c.; John Perry, Falgarth Road, and William E. Ayrton, Cowper street, County of Middlesex, England.

326,268 Telephone receiver; William Burnley, North East, Pa., assignor of two-thirds to Charles A. Hitchcock, same place, and Lewis F. Watson, Warren, Pa.

326,269 Telephone transmitter; William Burnley, North East, Pa., assignor of two-thirds to Charles A. Hitchcock, same place, and Lewis F. Watson, Warren, Pa.

326,270 Induction coil; William Burnley, North East, Pa., assignor of two-thirds to Charles A. Hitchcock, same place, and Lewis F. Watson, Warren, Pa.

326,337 Electrical apparatus for controlling marine engines; Louis M. Sanders, Roseville, Mich.

326,359 Electric organ action; Geo. C. Wacker, New York, N. Y.

326,363 Electric lamp hanger; Wm. S. Weston, Chicago, Ill.

326,364 Electric lamp hanger; Wm. S. Weston, Chicago, Ill.

326,424 Safe; Oscar Gassett, Boston, Mass.

326,459 Bulb case for incandescent electric lamps; S. Howard Sprague, Pittsburgh, Pa.

326,487 Electric lamp; James du Shane, South Bend, Ind.

326,498 Arch for supporting electric lamps; P. Henry Griffin, Detroit, Mich.

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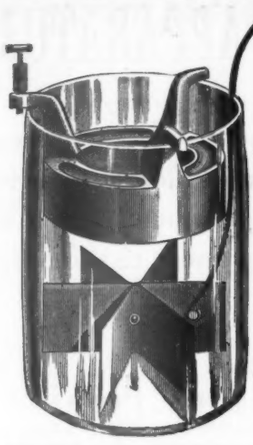

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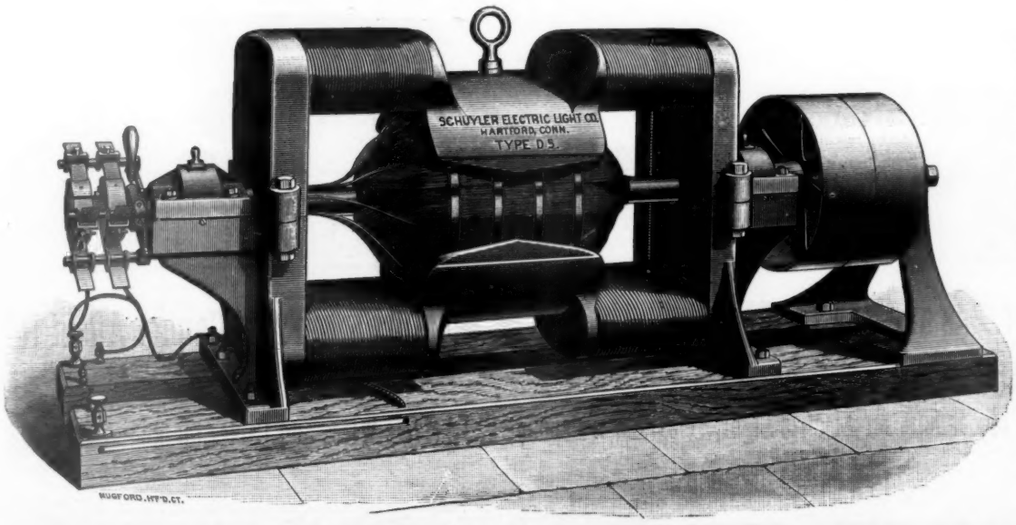

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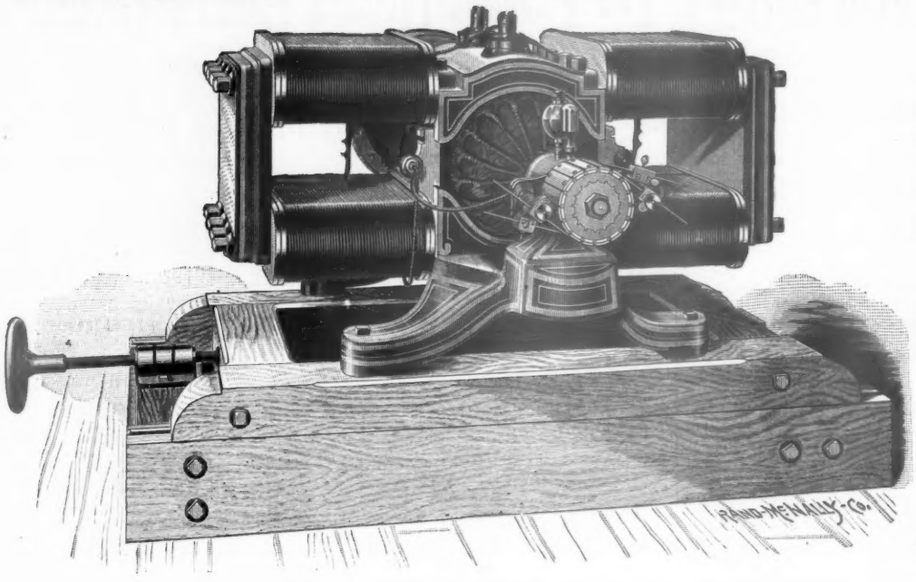

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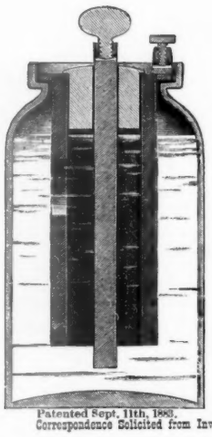

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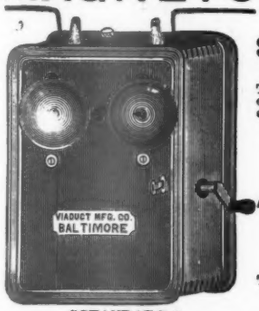

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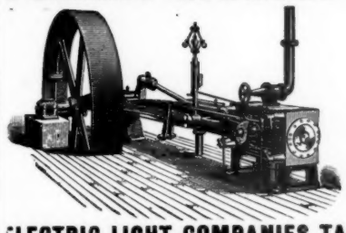

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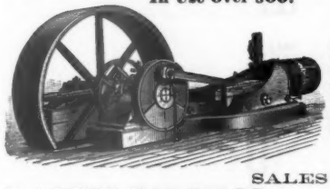

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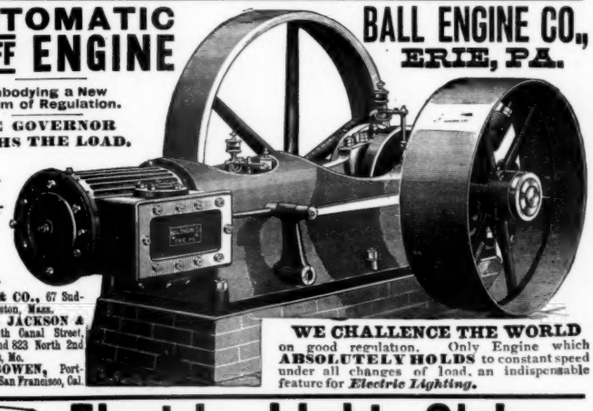

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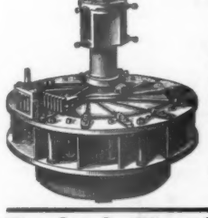

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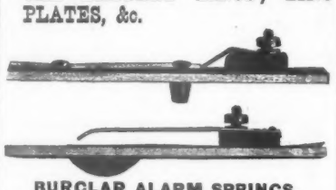

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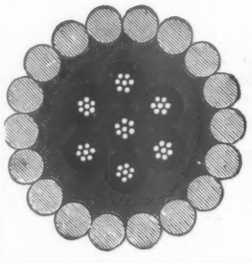

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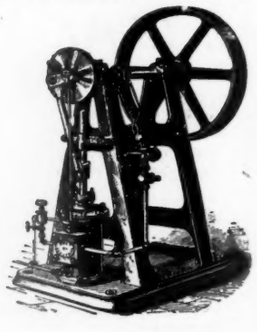

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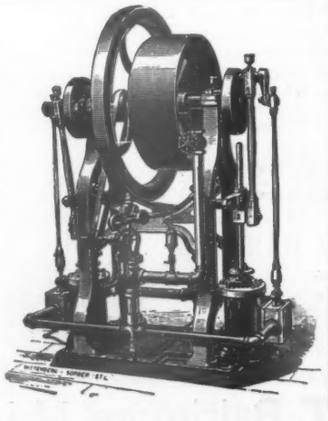

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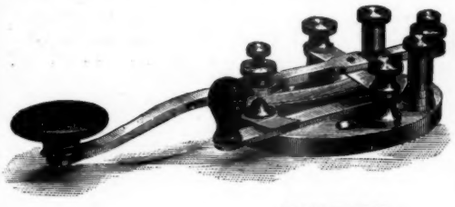
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